"A National Trade Journal"
TWENTY-SIXTH YEAR

The Heating and Ventilating Magazine

A Monthly Journal of Engineering Progress

Vol. XXVI. No. 5. MAY, 1929 $2.00 a year. 30 cents a copy.

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The
NEW YORK
BLOWER
COMPANY
The Hall Mark of Quality

Gets Heat down into the "Working Areas" where it's needed

Old-time methods that let the heat waft up towards the roof can't effectively heat a building. For the upper, unused, spaces must be packed with heat before any of it gets down into the working areas.

Heat your building from the floor—UP. Not from the roof—DOWN.

With a McQuay a flood of warm air is forced down into the working areas, to points 75 feet distant and more—**the instant the heat and fan are turned on.**

For quicker more efficient heating

McQUAY

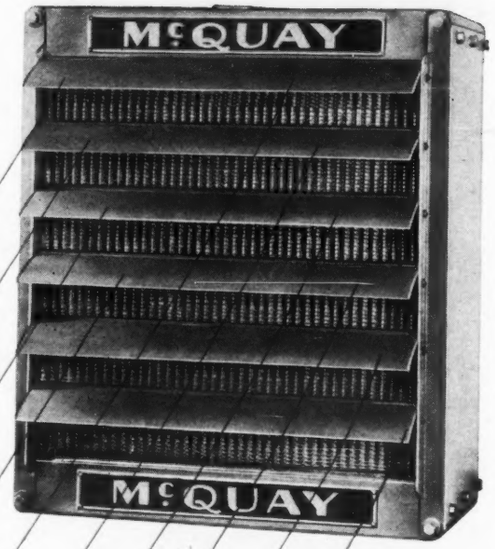
in factories, stores, large offices, etc.

UNIT HEATER

3 POINT FACTORY TESTED

Before any McQuay Heater leaves the factory it is **triply tested:** First, with a steam pressure far greater than it is ever likely to be subjected to; Second, to be sure it develops every bit of the heat guaranteed by its rated capacity; Third, to be sure that the motor and fan are absolutely noiseless.

The heating element is **all copper**—braised—absolutely eliminating leaks.



Up, off the floor, out of the way, yet this McQuay heater weighing less than 150 pounds will provide as much heat as 700 square feet of cast iron radiation.

Heats 2500 sq. feet of floor space, driving the heat 75 feet and more.

It will keep a continuous flow of warmed air circulating over a floor area of 2500 feet, comfortably warming even those workmen 75 feet away from it. By arranging the adjustable deflectors heat can be sent just where it is needed.

Costs Less

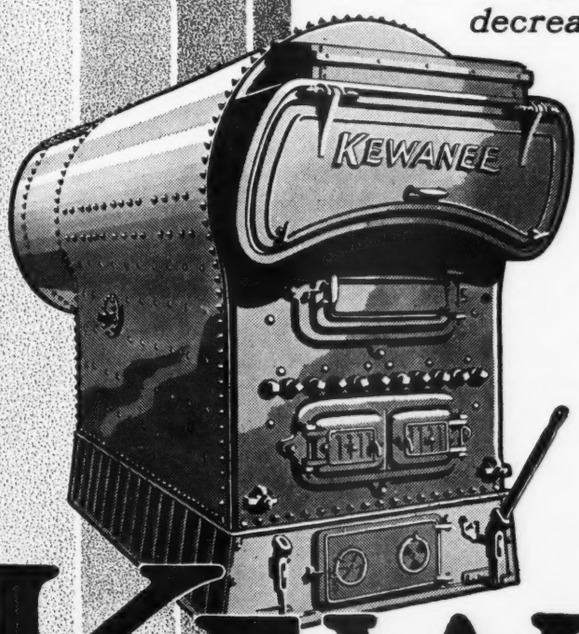
McQuay costs less. installed, than the older heating methods. And it doesn't waste heat. It sends it all where it is needed—another saving.

McQUAY RADIATOR CORPORATION **General Sales Office: Pure Oil Building, Chicago**

New York: 2148 Graybar Bldg. Boston: 10 High St.
Newark, N. J.: J. F. McLaughlin Co., 738 Broad St.
Cleveland: 291 E. 149th St.
Pittsburgh: Bushnell Mach. Co., Century Bldg.

If the First Cost is too low--the Final Cost will be too high

Any maker can build a low priced boiler. But to do so, he must take something out of it—something that lessens the boiler's life, and *decreases its efficiency.*



So that any saving on the purchase price is soon swallowed up by the higher fuel and upkeep costs.

Kewanee Boilers are built (of steel, riveted) according to designs and specifications which 50 years of building have proved are right. And they are priced fair enough to permit putting into them the necessary quality of steel and quantity of rivets for husky joints to stand the gaff of many years hard service.

KEWANEE STEEL BOILERS

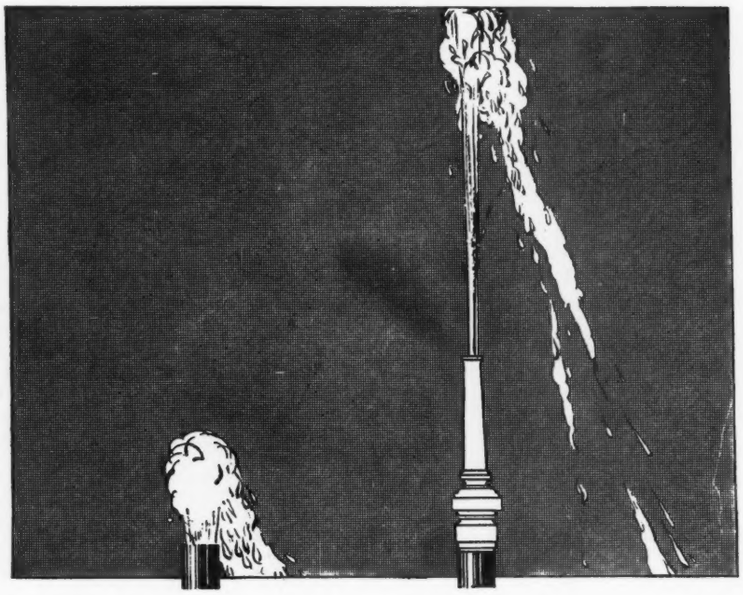
Hence in building from the boiler up the user of a Kewanee can rely on many extra years of "service", plus a fuel saving during every year of its life.

KEWANEE BOILER CORPORATION

Kewanee, Ill. Branches in Principal Cities

THE HEATING AND VENTILATING MAGAZINE, published by NATIONAL TRADE JOURNALS, INC., at 521 Fifth Avenue, New York, N. Y. Subscription rates: United States, $2.00; Canada, $2.50; Foreign, $3.00. Single copies, 30 cents. Vol. XXVI, No. 5, May, 1929. Entered as second-class matter, April 18, 1925, at the Post-Office at New York, N. Y., under the Act of March 3, 1879.

The high velocity obtained in the stream of water from a fire hose by the use of a nozzle illustrates the Pacific side-connection principle. By confining rising steam and water to restricted outlets, forced circulation results.



Forced circulation in the Pacific

Why a nozzle on a fire hose? Necessity for velocity!

How do you get velocity? By reducing the diameter of the orifice!

A simple and well-known principle of hydraulics.

Apply this principle to the well-known fact that the ability of water to absorb heat from a surface is proportional to the velocity of flow of the water across that surface, and you have a picture of the positive circulation feature in the Pacific Steel Heating Boiler.

The Pacific side-connections do the work of the hose nozzle. The steam and hot water, instead of rising sluggishly through free waterways between the fire-box water-jacket and the shell (as in other boilers), is shot up through properly proportioned connecting orifices into the shell and across the boiler tubes at a high velocity.

PACIFIC

STEEL HEATING BOILERS

AND CAPITOL RADIATORS MAKE A LOGICAL COMBINATION

Result: Steam bubbles that form on and insulate the tubes are "scrubbed" off by this forced circulation. A greater amount of heat is thus absorbed by the water.

There is a Pacific installation for your next building which will give you the maximum in fuel economy with greatest ease in maintenance. Write for literature on all types of installations.

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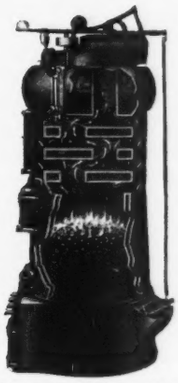
TRADE MARK REG. U.S. PAT. OFF.

PACIFIC STEEL BOILER CORPORATION
Factories: Waukegan, Ill., Bristol, Pa.
Sales Offices in 58 Cities
Division of United States Boiler Corp., Detroit, Mich.

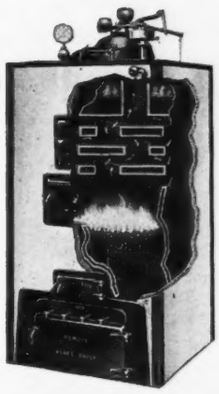
Specify Page Boilers



Volunteer Boiler, for the utmost in home comfort

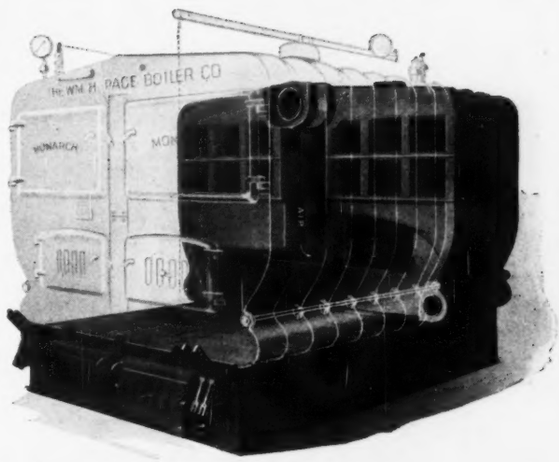
MORE grate, more heating surface, proportioned for high efficiency and fuel economy — all good reasons why Page need not rely on extravagant claims, but can point to an enviable record (since 1856) of heating satisfaction under most difficult conditions, and in about every type of structure.

Page Boilers are built in round and square sectional form, from the 11″ Volunteer to the 60″ Monarch twin - section boiler, for the largest of jobs. They will fit almost any job, and satisfy your most critical client.



Red Diamond Jacketed Boiler, in red and black, to brighten up the cellar

Let us send you our Red Diamond Display Poster in colors



Monarch 60″ Twin Section Boiler, for the big jobs. Same efficient construction in smaller sizes.

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Judge boilers *by these* 10 POINTS of Superiority

1—Unrestricted circulation.

2—Smokeless.

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4—Full length self-cleaning convex crown sheet.

5—Tubes easily cleaned from outside.

6—One large body of water.

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COIL

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It is one thing to gain a reputation for quality and another to maintain it. The reputation of Coil Steel Boilers is maintained from year to year because the quality never varies.

Wherever a Coil Boiler has been used on a job, there you will find a satisfied customer and a heating contractor who is willing to boost Coil Boilers because they have made real money for him.

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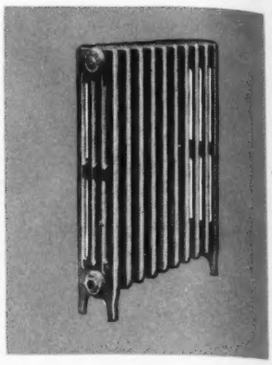
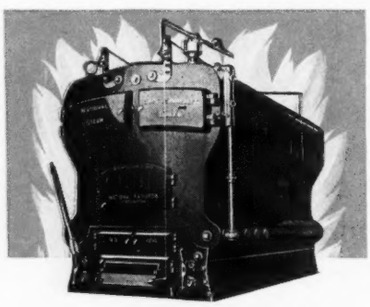


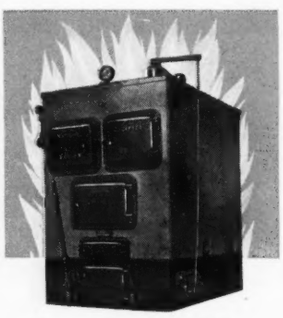
Aero Radiation

Aero Radiators pioneered the way to new heating efficiency, were the first to supply beauty for every setting and utility for every heating purpose.



National Super-Smokeless Boiler

Specifically designed for the efficient and smokeless combustion of all grades of fuel. Distinguished for its swirling scarlet flame, and balanced secondary air supply.



National Jacketed Boiler No. 4 Series

Brings a new conception of what a boiler can offer in outstanding attractiveness, fuel-saving efficiency, and upstanding service; a striking and colorful jacket, and contrasting trim.

National Jacketed Gas Boiler No. 1

Cleanliness, convenience, accurate maintenance of any desired degree of warmth—are the contributions of this strikingly attractive, highly efficient boiler.

National Novus Boilers

These businesslike, dependable, effective boilers have for 18 years been demonstrating their worth in all types of applications, all over the country.

National Round Boiler

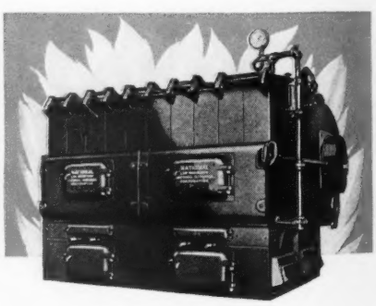
In residential and small building heating, its staggered fire travel leads straight to efficiency, economy, and complete and permanent user satisfaction.

National Contento Boiler

Furnishes the old house, the small house, or the house without a basement with radiator heat, at almost the price of coal stoves.

National Gothic Hot Water Supply Boiler

Provides a constant, unfailing supply of hot water for home and small apartment use, at an extremely low fuel cost.



National Low Water Line Boiler

Where lack of head room is the problem, this boiler is always the best, often the only, solution; highly efficient.

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Made-to-Measure
HEATING SYSTEMS

Made-to-Measure · *the* NEW VOGUE *in* HEATING *backed by* NATIONAL'S *big* SALES PROMOTION PLAN

1. **National Bonded Boilers—**
   A Surety Performance Bond with every National Boiler.

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   Exclusive and revolutionary—a partial payment plan backed by a joint life, permanent disability and fire insurance policy.

3. **National Heating Guide—**
   Blue Book of the Industry—chock full of pertinent facts, tables and informative data—a real handbook for the industry.

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   Beautiful, outdoor swinging metal sign with ornamental bracket. A real business producer.

5. **Direct Mail Campaign—**
   Illustrated Letters bearing Heating Contractor's personal imprint.

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Many Palatial American Homes Equipped with Hardinge

The ever-growing number of architects and leading engineers who are specifying Hardinge Fuel Oil Heat is but a true index of the basic merits of this precision-built fuel oil burner. Our two models, Domestic and Industrial, in 9 different sizes and combinations, enable specific treatment for any heating problem from bungalow to skyscraper. Engineers are specifying an oil burner that has already proved itself marvelously efficient and dependable in hundreds of America's most palatial homes and buildings when they recommend Hardinge Fuel Oil Burner.

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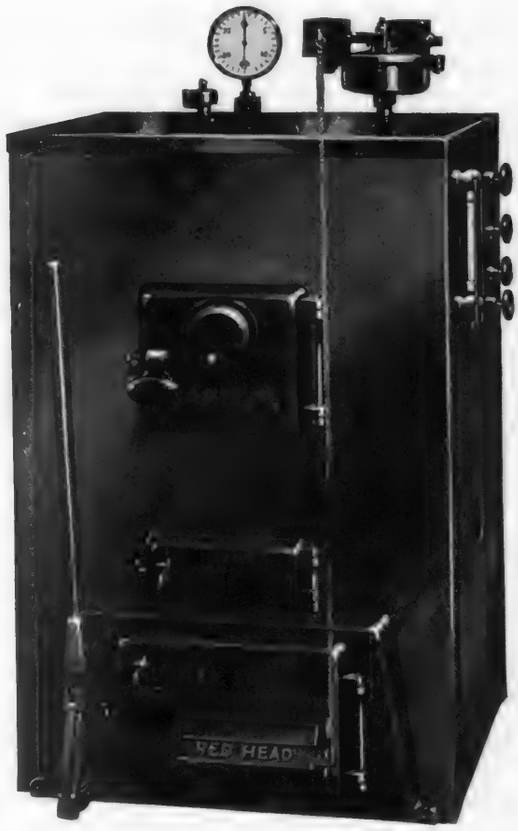

The Capitol Red Head

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makes its bow

A beauty! . . . a marvelous heat maker! . . . Surprisingly low in cost. For small homes and bungalows. To be announced in the July National magazines.

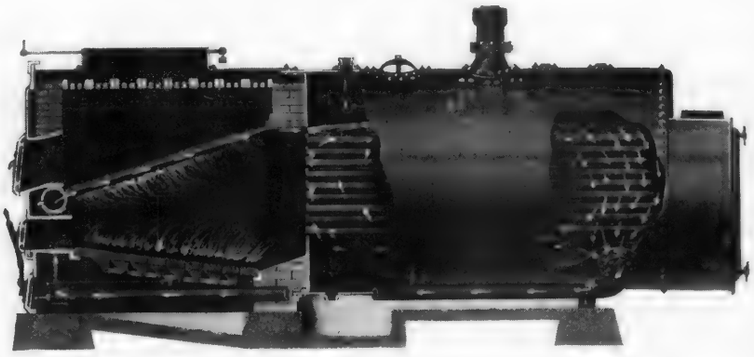
UNITED STATES RADIATOR CORPORATION - DETROIT, MICHIGAN

8 Factories and 34 Assembling Plants Serve the Country · For 39 years builders of dependable heating equipment

Capitol Boilers

AND RADIATORS

Stanwood Smokeless Boilers



Economies of Operation Every Boiler Buyer Should Know

Every plant owner, engineer, architect and builder is vitally interested in reducing heating and power costs. When he purchases a boiler it must possess characteristics of construction and operation that will minimize maintenance cost. When he decides on a Stanwood Boiler he answers his question as to—which one? Some of the notable characteristics of Stanwood Boilers are.....

LOW OPERATION COST—Liberal chamber gives you thorough and complete combustion of fuel. Gas passages are long so that proper heat operation takes place before the gases pass to the stack. Water passages are very liberal and arranged to insure good—and rapid circulation. Absence of air leaks and a minimum radiation loss all contribute to making Stanwood boilers the most economical and efficient on the market.

LOW MAINTENANCE COST—The Stanwood boiler has no firebox or mudlegs to fill up and corrode, no staybolts to rust and break off. The shell cannot be bagged or burned; neither can its circumferential seams be cracked for nowhere are these surfaces exposed to fire. No internal flues to collapse. No crownsheets to drop if water is low or if scale or oil collects on its surface.

LOW INSTALLATION COST—Deep excavating is not essential—due to the low water line (48 to 75 in.) depending on the size of the boiler, 64 to 97 inches only is required for headroom. Where cellar depths are determined by sewer or blow-off levels the marked advantages of Stanwood low water line boilers are apparent.

Stanwood Boilers are built for coal, oil or gas in sizes 29 to 250 H.P. (3500 to 31,000 sq. ft. steam radiation) for working pressures of 15, 100, 125 and 150 lbs. Built for higher pressure if desired. Write Dept. D-59 for complete information.

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THE STANWOOD CORPORATION

Established 1891 CINCINNATI, OHIO

Stanwood Smokeless Boilers

TITUSVILLE HEATING BOILERS

IN many of New York's famous apartments catering to the most critical patronage in the world—it is significant, indeed, that Titusville Boilers were chosen for that all-important duty of maintaining correct heat at an economic cost.

Yet, you have only to know the sterling past-performance record of Titusville Boilers, in hundreds of older installations, to realize why so many builders and contractors place such implicit confidence in Titusville Boilers.

May we acquaint you with the detailed facts of Titusville Boiler dependability?

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Plan Ahead with Scale Free Pipe -made to resist corrosion

The high order of service expected from equipment in a building of today will not be made easier in the years to come. On the contrary, the demands will be more exacting.

Particularly is this true of the service to be given by the pipe lines. Pipe must be installed that is made especially to resist corrosive influences.

Scale Free Pipe is a rust-resisting pipe and is the best assurance for long life and satisfactory service, especially in districts where the water is quite corrosive. Mill-scale is one of the principal causes of corrosion, particularly "pitting"; is electronegative to the pipe metal and sets up galvanic action causing pitting around the scale areas — therefore, when scale is removed, longer life is obtained from the pipe. "NATIONAL" Pipe, butt-weld sizes ½ to 3-inch, is made by a scale removing process. This is a patented process and applied exclusively to "NATIONAL" Pipe.

We will be glad to send Bulletin No. 7, which explains the advantages of the Scale Free Process. Also Bulletin No. 19—"NATIONAL" Pipe for Plumbing and Heating. The Scale Free Process, plus Spellerizing, has contributed in making "NATIONAL" —

America's Standard Wrought Pipe

NATIONAL TUBE COMPANY • Pittsburgh, Pa.

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NATIONAL

USE THE PACKING-LESS EXPANSION JOINTS

PACKING in an expansion joint means maintenance. Periodically, you have to open up the manhole or trench and send a man down into cramped quarters to "service the line."

Badger Self-Equalizing Joints eliminate this maintenance work. They use no packing. They need none.

Perhaps this is one of the reasons why the New York Steam Corporation has installed some 3000 Badger Joints in their extensive steam delivery lines in New York City, the first units being put in about fifteen years ago.

Dependable service on these 175 lines with Badger "Packing-less" Expansion Joints points the way to dependable service on any line.

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BADGER EXPANSION JOINTS

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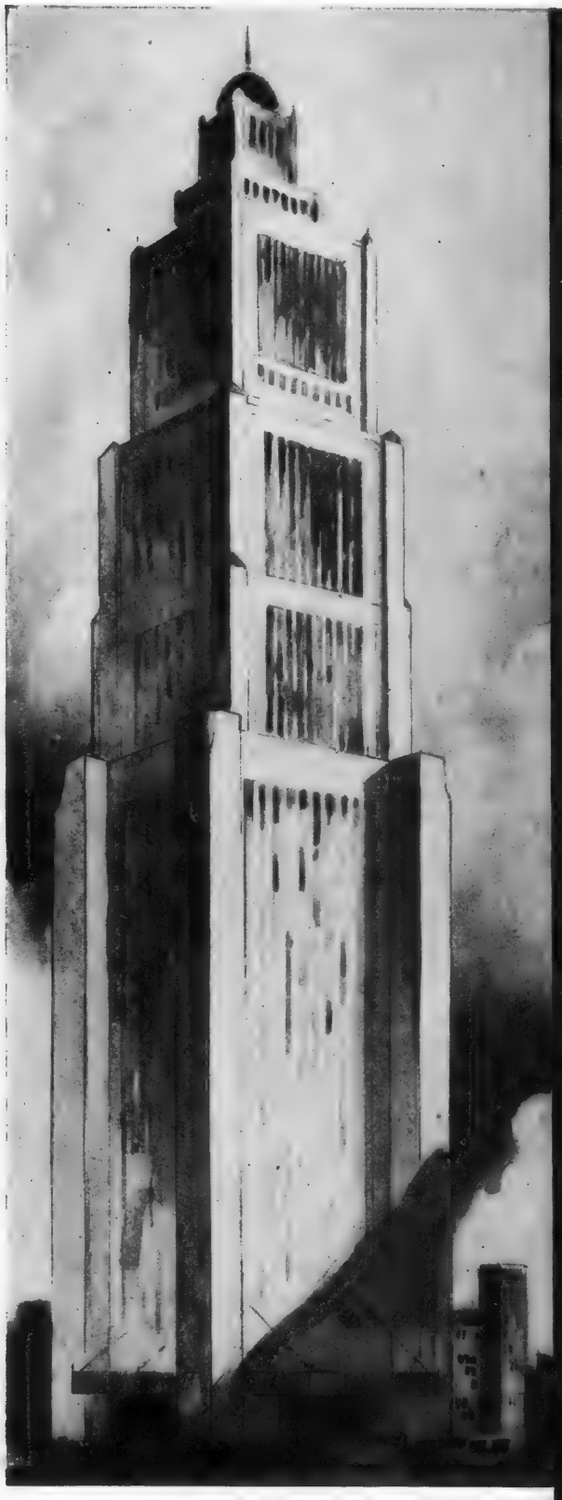

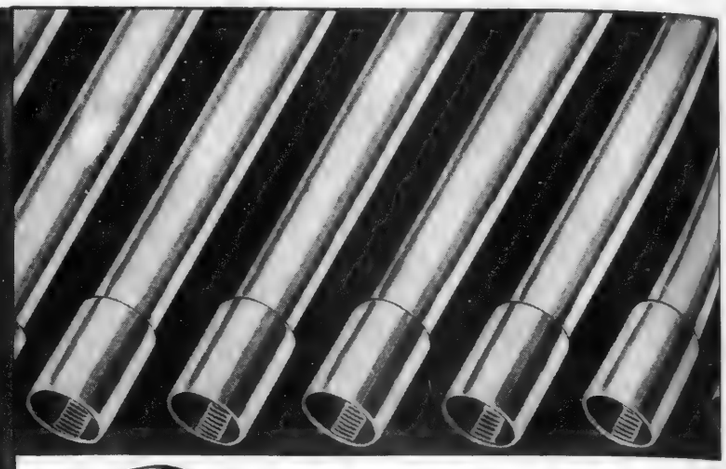

PIPING *that measures up to the* BUILDING

Heating and ventilating engineers everywhere prefer and demand "Etna" Welded Steel Pipe because of its proved dependability—the pipe that is time tried and time perfected by a century of service to industry.

A rigid, inflexible standard of workmanship and a skill sharpened by years of practice has established "Etna" in the abiding confidence of pipe users the world over—a fine pipe worthy of America's finest buildings.

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Will you share

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Heating contractors have been adding to their incomes through Electrol's co-operative proposition. Do you know about it?

You know the reputation which Electrol enjoys all over the country. You know how extensively Electrol is sold. How Electrol is growing in sales and public acceptance.

Electrol dealers are all set for a bigger year than ever. Do you want to share in the progress and profits ahead of us? You can! By making working arrangements with the local Electrol dealer whereby you will profit from each sale of an Electrol Oil Burner to your customers.

It requires no investment on your part. You don't have to become an oil burner dealer. You merely work in close co-operation with your local Electrol dealer. He is fully competent and will assume all responsibility for installation and service.

The certain satisfaction of the Electrol burner will enhance the professional reputation of any heating man who recommends it.

Get Full Details

The Electrol representative in your city or nearest you can explain the whole proposition in a few minutes. It will be worth your while to get in touch with him. If you don't know his name, write us.

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The OIL BURNER *with the Master Control*

Listed as standard by the Underwriters' Laboratories, and bears their label

MEMBER OIL HEATING INSTITUTE

The world's largest apartment building, The Beresford, in New York City, will be heated by

The Dunham Differential Vacuum Heating System

THE world's largest and most beautiful apartment building, The Beresford, at 81st and 82nd Streets and Central Park West in New York City, will be occupied by tenants of international repute in the fields of banking, industry and commerce. No expense has been spared to provide a structure not only of commanding external beauty and dignity, but of incomparable luxury, comfort and convenience within.

The Beresford Apartments are twenty stories in height, with the addition of a pent house and three towers which will be used as observatories and from which an extensive view of the city may be obtained. The architecture is modern Barocke, in stone, brick and terra cotta, and the design provides garden terraces in the setback upper stories.

Suites of from 4 to 18 rooms will be available in The Beresford, room sizes being from 22 x 38 feet for living rooms, 20 x 24 feet for dining rooms, 17 x 26 feet for chambers and with galleries of 12 x 30 feet. The furnishings throughout will be unsurpassed in richness and beauty.

A Dunham Differential Vacuum Heating System is being installed in The Beresford Apartments, the selection of this system indicating the care with which the owners and builders (H. R. H. Construction Corp.) sought, and found, for their building, the most satisfactory form of steam heating that modern engineering has thus far developed.

Over eighty sales offices in the United States, Canada and the United Kingdom bring Dunham Heating Service as close to you as your telephone. Consult your telephone directory for the address of our office in your city. An engineer will counsel with you on any project.

Look for the name DUNHAM

This nameplate identifies a genuine Dunham Thermostatic Radiator Trap.

U. S. Patent No. 1644114. Additional patents in the United States, Canada and foreign countries now pending.

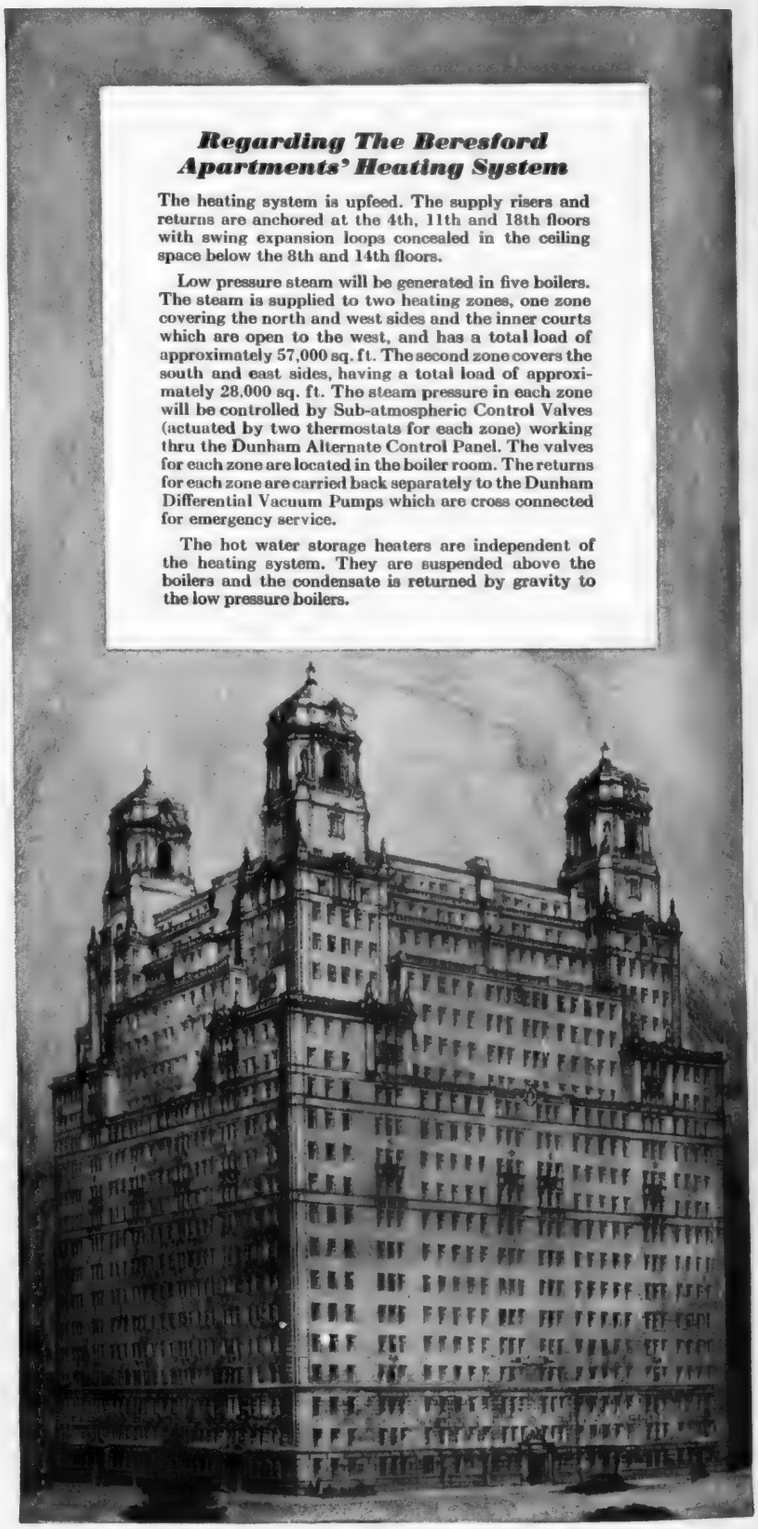
C. A. DUNHAM CO.
DUNHAM BUILDING
450 East Ohio Street, Chicago

Regarding The Beresford Apartments' Heating System

The heating system is upfeed. The supply risers and returns are anchored at the 4th, 11th and 18th floors with swing expansion loops concealed in the ceiling space below the 8th and 14th floors.

Low pressure steam will be generated in five boilers. The steam is supplied to two heating zones, one zone covering the north and west sides and the inner courts which are open to the west, and has a total load of approximately 57,000 sq. ft. The second zone covers the south and east sides, having a total load of approximately 28,000 sq. ft. The steam pressure in each zone will be controlled by Sub-atmospheric Control Valves (actuated by two thermostats for each zone) working thru the Dunham Alternate Control Panel. The valves for each zone are located in the boiler room. The returns for each zone are carried back separately to the Dunham Differential Vacuum Pumps which are cross connected for emergency service.

The hot water storage heaters are independent of the heating system. They are suspended above the boilers and the condensate is returned by gravity to the low pressure boilers.



Architect: Emery Roth *Heating Contractor:* Raisler Heating Co.
Consulting Engineers: Eadie, Freund & Campbell

Handy as a Flashlight

A FLOOD OF HEAT—instantly—where you want it—when you want it—over your entire floor area or part of it. A turn of a switch—you have heat. Another and it's off. The operation of Modine Unit Heaters is as simple as the use of a pocket flashlight.

Modine Unit Heaters are suspended from the steam line. From a height of from 10 to 14 feet they distribute the heat *down* and *keep it down*. They furnish healthful, comfortable heat—no cold spots—no overheating . . . They cost less to buy and less to operate. Let us send you complete facts today.

MODINE MANUFACTURING COMPANY

1707 Racine St. *(Heating Division)* Racine, Wis.

Branch Offices in all Large Cities

London Office: — S. G. Leach & Co., Ltd., 26-30 Artillery Lane

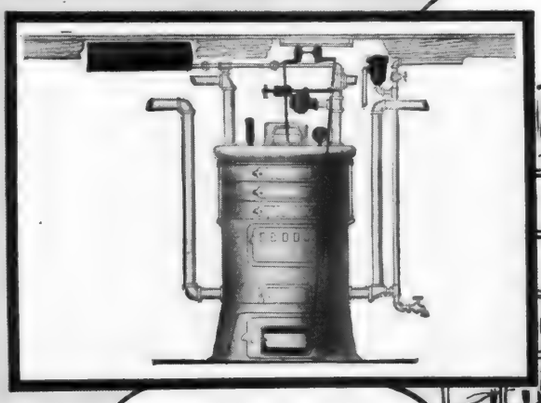
MODINE UNIT HEATER
Model No. 701—weighs only 130 pounds, replaces approximately two and one half tons of cast iron radiation.

Modine

Unit HEATER

A MODINE Product

FOR STEAM, VAPOR, VACUUM, HOT WATER HEATING SYSTEMS

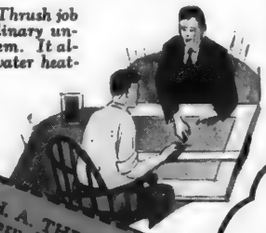


The best kind of advertising!

ONE of our dealers told us recently, "When I complete a Thrush installation, I know it is going to deliver 100 per cent Heating Efficiency---now---next year ---and many years in the future! It will continue to build good will for me! My customers are always satisfied and that is why I like to sell it."

Of course, there is another reason why dealers like to sell Thrush System and that is *profit*. The margin is generous, the sales plan is very effective, instalation is not expensive and Thrush Equipment gives any dealer the edge on competition.

Often a well planned Thrush job costs less than an ordinary unregulated gravity system. It always makes any hot water heating job work better.



Coupon!

H. A. THRUSH & CO.
Peru, Ind.

Send me illustrated catalog and price list—and tell me more about the profit-making Thrush System.

Name_____

Address_____

Satisfied!
~and they tell others

Say goodbye to sluggish heat when you put Thrush System on the job. Thrush changes the job from gravity to a controlled pressure system with automatic damper regulation---that means increased heat transmission, greater fuel efficiency and more home comfort. Your customers will praise it highly and thank you for suggesting it.

One customer pleased means many more prospects. That is why thousands of dealers have found that Thrush System is truly a business builder. Now is the time to go after business. We have a complete series of posters, blotters, folders and dealer ads that will help you.

H A THRUSH & CO.
Peru ~Indiana

THRUSH SYSTEM
OF HOT WATER HEATING

Use 48% Less Fuel

"The two Heggie-Simplex Boilers in our buildings at Armour Blvd. and Campbell St. are two years old and have given perfect satisfaction in every way.

"These two boilers are overloaded to the extent of some 750 feet of radiation, but have carried the load at 12 degrees below zero with apparent ease.

"On checking the consumption of fuel oil based on number of feet of radiation, also type of building, figured on a comparative basis with other makes of boilers, we find that Heggie-Simplex is more economical."*

C. O. Jones Building Co., Kansas City, Mo.
By N. W. Duff

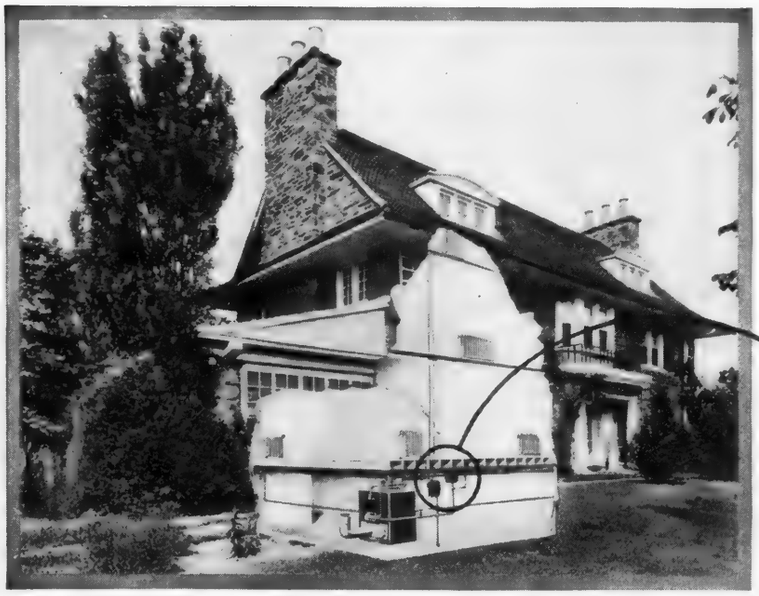
***A recent check showed that the owner's oil bill for heating these twin apartment buildings has averaged per square foot of radiation only 7.8c.**

The owner advises us that the cost of heating another apartment building of the same type, using another make of steel boiler with an oil burner similar to that used in the Heggie-Simplex boilers, has averaged per square foot of radiation 14.9c.

Heggie-Simplex engineers can show you also how to obtain important savings in heating costs. Ask for one to call. Heggie-Simplex Boiler Co., Joliet, Illinois. Representatives in principal cities. Telephone and address listed under "Heggie-Simplex Boilers."

HEGGIE-SIMPLEX

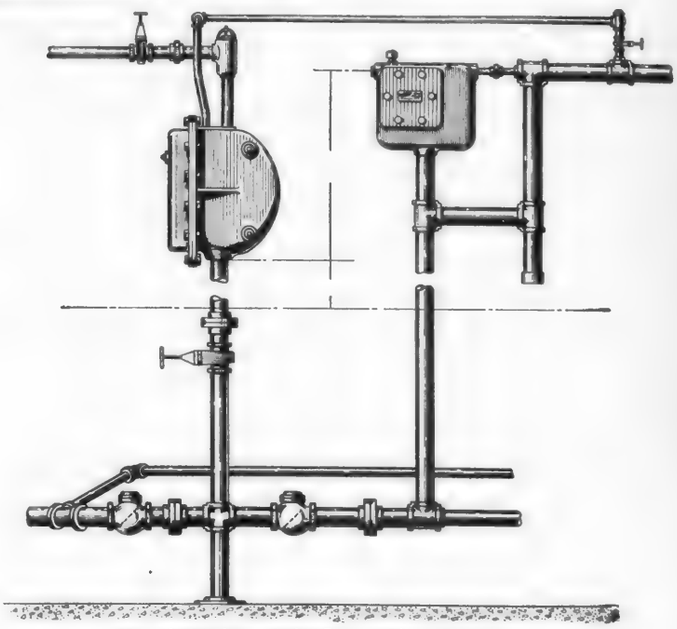
STEEL HEATING BOILERS



Heating contractors favor the Simplicity of a Webster Type "R" Installation

IT MIGHT be supposed that such a highly engineered system as the Webster Type "R" would require intricate installation plans. The above diagram, however, shows you just how simple the layout actually is. And the job is made still easier by the co-operation of Webster Steam Heating Specialists from the branch office nearest you. Correct installation is greatly simplified by Webster data and Service. Roughing-in dimensions are provided for the correct Webster equipment for each individual job, as well as the piping arrangement best suited to the required radiation.

The next time you are figuring on an ordinary hot water or one-pipe system, submit an alternate bid on a Webster Type "R" and do some selling. We'll help you to build up a *preferred* business in this way.



How the Webster Boiler Return Trap Operates

When conditions arise which create higher pressure in the boiler, the water being unable to flow into the boiler, backs up into the Webster Boiler Return Trap. The float trips, admitting steam from the boiler and equalizing the pressure in these two compartments. Again gravity comes into play and the water flows back to the boiler. When the Boiler Return Trap has emptied, the mechanism returns to its first position, closing the valve to the boiler and opening an exhaust valve leading to the dry return piping. This equalizes pressure in the returns with that in the Boiler Return Trap and the latter begins to fill again provided the pressure is still sufficient to prevent flow of condensation directly back to the boiler.

- since 1888 **Webster** *Systems of Steam Heating*

The Webster Steam Heating Specialist in your vicinity can probably help you in developing *preferred* business, with Webster Type "R" Systems. Get in touch with him.

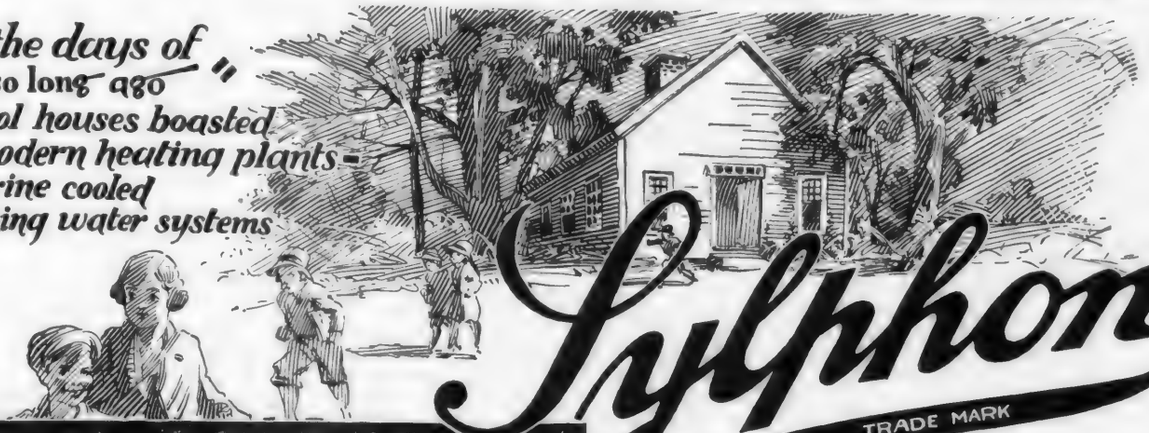
WARREN WEBSTER & COMPANY, CAMDEN, NEW JERSEY

WARREN WEBSTER & COMPANY, Camden, New Jersey. HVM-5-29

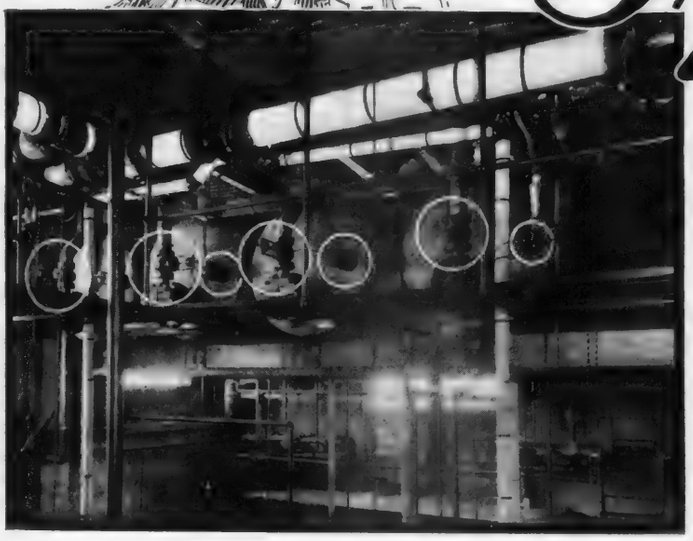
Please mail Bulletin B-600, describing the Webster Type "R" System of Steam Heating to

Name..... Street..... City.....

Engineering Achievements and the Perfect School House



Sylphon TRADE MARK Temperature CONTROL



Shown above are four Sylphon Regulators installed on storage tanks in the new Roosevelt School at Des Moines, Iowa. Sylphon Temperature Regulation is an important factor in maintaining an even school-room temperature, and in regulating the brine-cooled drinking water system.

Specified for Many of the Nation's Finest School Buildings

MODERN engineering skill has given to America adequate heating plants, efficient ventilation, and brine-cooled drinking water systems to keep pace with its thousands of splendid examples of school architecture.

Sylphon Temperature Control has contributed largely to these heating and refrigerating triumphs. In the Nation's *great hotels, industrial plants,—office buildings and hospitals, too, Sylphon Temperature Regulators are performing, without supervision or repair, a service of highest dependability.*

The Sylphon Bellows

All Sylphon Instruments, whether designed for the control of temperatures or pressures of air, liquids or gases, for the control of brine-cooled refrigerating systems, or the maintenance of predetermined room temperatures, have as their motor element, *the original* and only genuine Sylphon Bellows. This, the most sensitive, flexible and durable expansion element known to science, was originated and patented by The Fulton Sylphon Co.

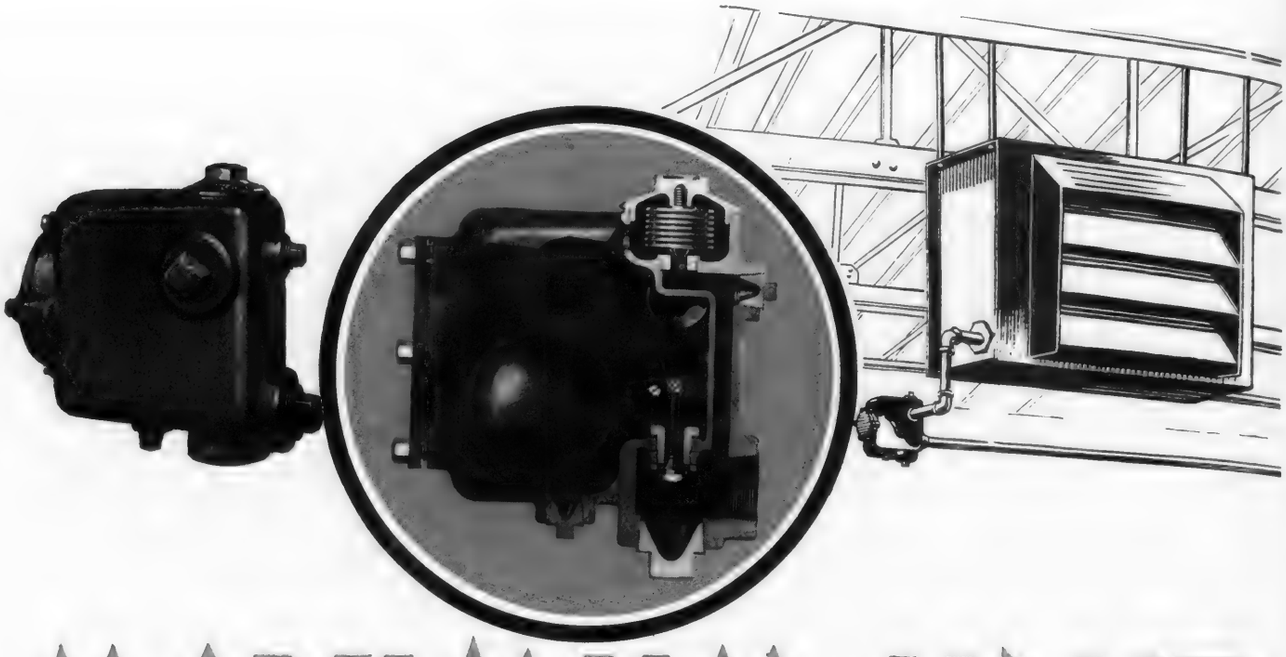
SEE OUR CATALOGUE IN SWEETS

Whether the job be large or small it will pay you to install Sylphon Instruments. You are invited to submit to our engineers (without obligation) problems involving the use of Sylphon Specialties.

Write for Bulletins HT-110 and HT-106.

THE FULTON SYLPHON COMPANY
KNOXVILLE, TENNESSEE

Representatives in all Principal Cities in U.S.A.—European Representatives, Crosby Valve and Engineering Company, Ltd., 41-2 Foley St., London, W 1, England.—Canadian Representatives, Darling Bros., Ltd., 140 Prince St., Montreal, Que., Canada



MAXIMUM UNIT HEATER EFFICIENCY

WITH THE ADVENT of unit heaters and copper radiating surfaces, there came a need for a new trap to meet the different and more exacting requirements of this type of radiation.

Because of the decrease in efficiency in thermostatic traps operated over a wide range of discharge temperatures encountered in connection with the varying steam pressures used for unit heaters, the No. 0 Blast Trap has been designed as a combination thermostatic and float trap to meet widely varying conditions without loss of efficiency.

The No. 0 Blast Trap maintains a continuous flow of condensate from the unit, regardless of temperature of condensate, and quickly evacuates the water of condensation under all conditions, eliminating entirely the possibility of freezing.

The No. 0 Blast Trap is designed primarily for unit heaters, being fitted with a Thermostatic member for the relief of air and a large area port opening controlled by a ball float for the evacuation of condensation.

The trap has a large capacity, being capable of discharging up to 1600 pounds of condensation per hour, the equivalent of 6400 sq. ft. direct radiation, with units operating at 5 pounds pressure.

The BISHOP & BABCOCK SALES COMPANY, Cleveland, O.

General Offices—4901-4915 Hamilton Avenue, N. E.

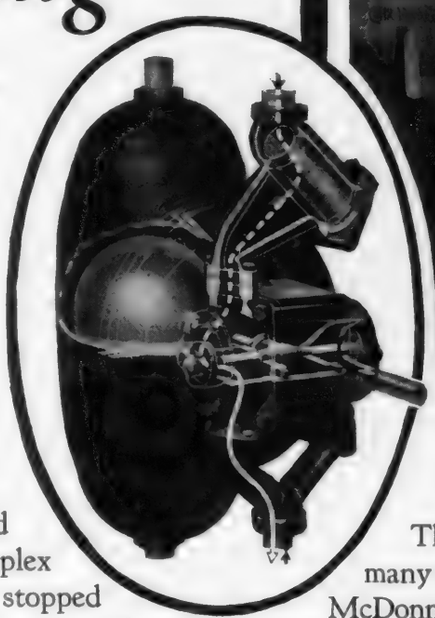
SALES AND SERVICE OFFICES

Baltimore Boston Bridgeport Buffalo Chattanooga Chicago Cleveland Dallas Denver Detroit Little Rock Los Angeles
Minneapolis Montreal, Can. Nashville New York Oklahoma City Philadelphia Richmond Scotia, N. Y. Spokane St. Paul Tulsa

BISHOP & BABCOCK

TEMPERATURE REGULATION
HEATING SPECIALTIES VENTILATING EQUIPMENT

There are times when only a *self-cleaning* feeder is *safe*



YOU probably realize that no heating boiler is properly protected until it is equipped with a duplex feeder. But have you ever stopped to consider the fact that a number of conditions are met by only *one* feeder?

Where feed water is particularly hard, for instance, it is doubtful whether any feeder can cope with this condition except the feeder with "the valves that stay new"—the feeder with the rotary, self-grinding valves. And it is certain that if the current to the condensation pump fails, only the feeder with capacity enough to supply the requirements of *any* heating boiler is *entirely safe*.

These are only two of the many outstanding features of the McDonnell & Miller Self-Cleaning Duplex Feeder, but they are characteristic of the refinements that place it in a class of its own—refinements like adjustable water level and adjustment in differential between valve openings.

When you install or specify such a feeder you *play safe*. Also remember that our unconditional guaranty for a full year shifts the responsibility from you to *us*.

Where shall we send our booklet covering capacity curves and similar data? Tell us on the coupon below.

Also made with single valve

Feeders built to the same high standard that is found in M. & M. Duplex Feeders are made with a single valve of the rotary, self-cleaning type. Ask for special bulletin covering this feeder.

McDONNELL & MILLER
710 Wrigley Bldg., Chicago

McDONNELL & MILLER
SELF-CLEANING
Duplex Feeder
"Doing one thing well"

McDonnell & Miller,
710 Wrigley Bldg., Chicago
Please send a copy of your 8-page booklet to:
Firm.....
Name.....
Street & Number.....
City & State.....
HVS

QUALITY

in a Heating System

The Sign B&J *of Quality*

Costs Very Little More

even in the first cost of installation.

Pays Handsome Dividends

in Comfort, Convenience, Noiselessness, Cleanness, Fuel Saving, Satisfactory Operation and Permanent Efficiency.

Barnes & Jones

VAPOR AND VACUUM HEATING SYSTEMS OF PROVEN QUALITY
Backed by 30 Years' Experience as Heating Engineers and Manufacturers

128 Brookside Avenue
Jamaica Plain, Boston

101 Park Avenue
New York City

Brownell

U N D E R F E E D

Stoker's

Pay For Themselves Out of the Savings

Why buy good coal only to waste it on hand-firing, or install a high grade boiler only to throttle its efficiency with a coal shovel?

Underfeed firing is the modern, money-saving way and it is the Brownell way.

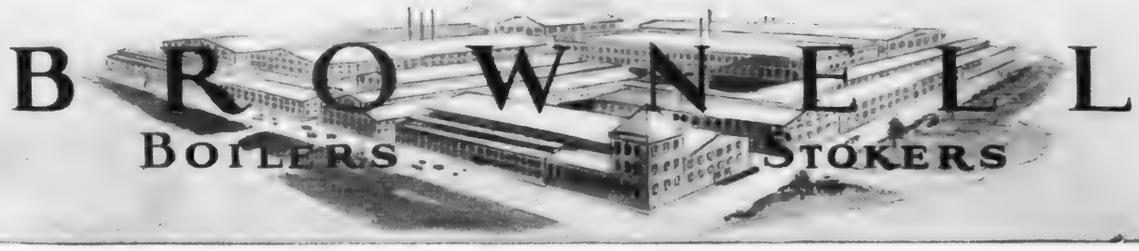
Brownell Underfeed Stokers may be installed under old or new boilers of any type or capacity. Plants so equipped burn the cheapest of coal, slack, screenings, or buckwheat, saving money on price. They require less of that cheap coal to maintain the pressure; also save on tonnage. In addition, they materially reduce boiler room labor—another economy.

Brownell Underfeed Stokers operate on the forced underfeed principle whereby the proper mixture of coal and air is constantly and automatically fed, thereby obtaining a uniform temperature, or boiler pressure, as well as effecting the economies on fuel and labor just referred to. They also eliminate smoke and enable the owner to observe his local smoke ordinance.

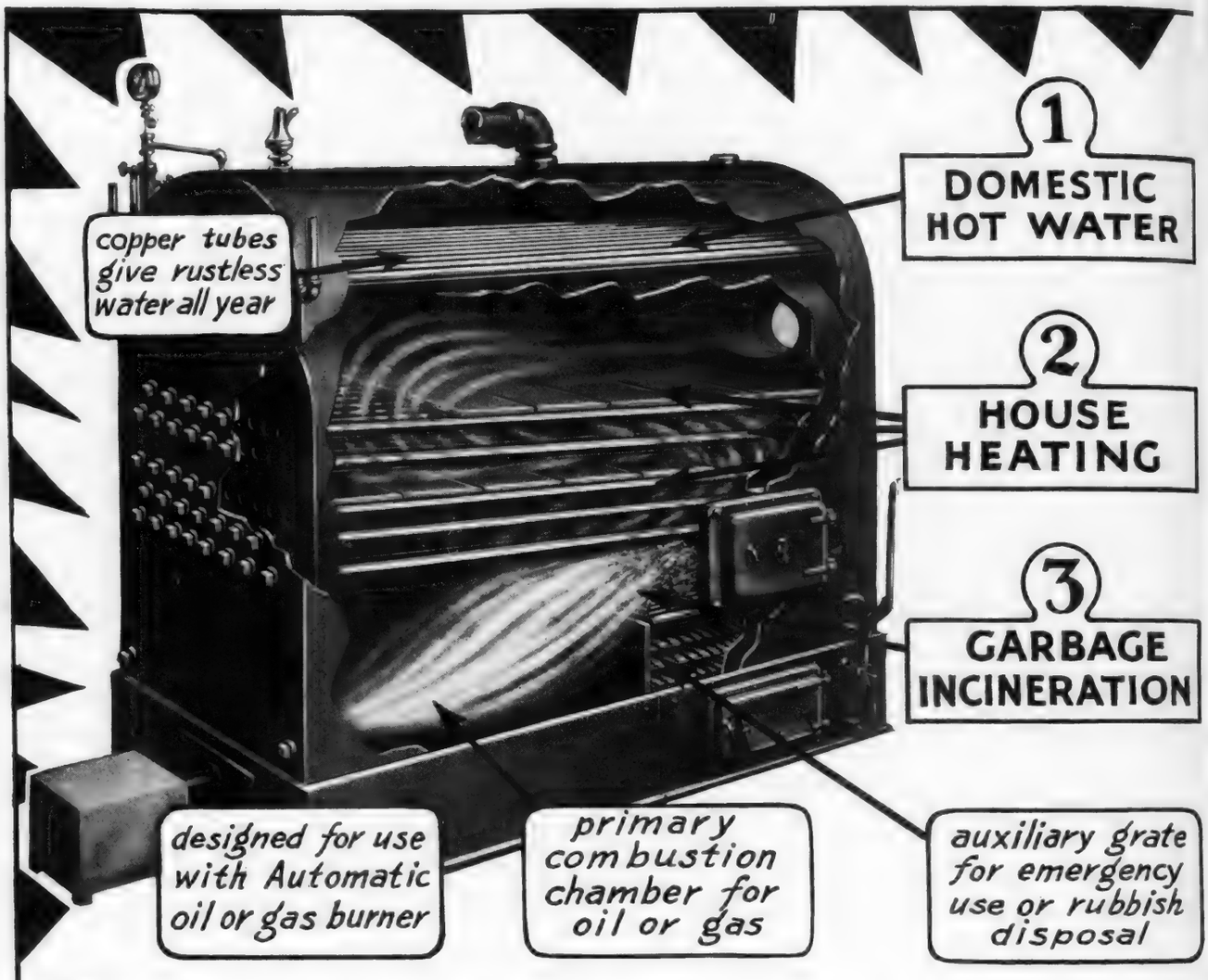
The Brownell line is complete—contains the particular type and size stoker individual requirements demand. Write for Bulletin S-50.

The Brownell Company

Established 74 years ago **Dayton, Ohio** *Offices almost everywhere*



TRIPLE SERVICE BOILER


copper tubes give rustless water all year
1
DOMESTIC HOT WATER
2
HOUSE HEATING
3
GARBAGE INCINERATION
designed for use with Automatic oil or gas burner
primary combustion chamber for oil or gas
auxiliary grate for emergency use or rubbish disposal

Remarkable design gives increased heating efficiency in one compact unit

Heat—Domestic Hot Water—Incineration—all in one heating unit. Here is the fullest service in one heating unit—house heating, domestic hot water and garbage incineration. Modern to the highest degree, the Triple Service Boiler operating automatically on oil or gas gives highest efficiency. Dependability, too, is built right in, for should oil or gas service fail, emergency grate can be started with coal or wood.

These boilers are constructed throughout of heavy gauge fire box steel, with electrically welded seams, and are built in strict accordance with the A. S. M. E. Code for 15 lbs. working pressure. The initial cost of the unit is less than the combined prices of separate standard equipment accomplishing the same three operations. Domestic hot water, through copper tubes, is supplied all year, yet the yearly fuel cost will be found lower than a standard boiler alone.

Complete odorless incineration of all combustible refuse is assured because of the location of the grate in the direct path of the flame.

During summer when house heating system is shut off, the hot water service continues, controlled by an Aquastat. The boiler works only long enough to raise boiler water to a temperature that will give plenty of domestic hot water. The life of the boiler is indefinitely prolonged by not shutting it down.

Still another interpretation of triple service is—lower first cost, lower upkeep cost and greater comfort and service.

THE INTERNATIONAL BOILER WORKS COMPANY
East Stroudsburg, Penn., U. S. A.

Sell Satisfaction *with larger profits*

Mueller Automatic Heat Control works both ways for the heating contractor—it gives the customer an up-to-date, more economical system at no greater cost to him—and yields a wider margin of profit at a lower cost for installation.

Either new or old plants are prospects—wherever hot water heat is involved the Mueller Automatic Heat Control System is mutually profitable to owner and contractor.

Write now for full information on the Mueller way to satisfied customers and greater profits.

MUELLER CO. (Established 1857) Decatur, Ill.
Branches: New York, Dallas, San Francisco, Los Angeles
Canadian Factory: MUELLER, Limited, Sarnia

MUELLER

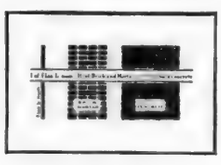
AUTOMATIC HEAT CONTROL SYSTEM

Flax-li-num

Increases Its Own Insulating Value 50% After It is Built Into the Walls

THE most remarkable characteristic of FLAX-LI-NUM . . and consequently the feature that makes it altogether different from other types of building insulation . . is the fact that it was actually designed to take advantage of the two-air-space method of application. FLAX-LI-NUM, when installed according to specifications, increases its own insulating value 50% after it is built into the walls . . it gives double resistance to escaping or entering heat by adding the extra resistance of two air spaces.

This greater efficiency of FLAX-LI-NUM is the inevitable result of a scientifically correct material applied in a scientifically correct manner. It is in keeping with the recommendations of the U. S. Bureau of Standards as set forth in their Letter Circular No. 227 . . "The insulating value of an ordinary air space more than about one inch in width is equivalent to about ¼ inch of insulating material. The addition of a half inch layer of insulation in the middle of an air space in a frame wall is, therefore, the equivalent of about a ¾ inch layer at some other place in the wall".

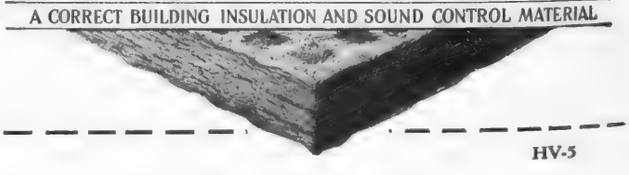


Let us send you full information on FLAX-LI-NUM, including specifications for every type of home construction . . apartment sound-deafening and roof insulation. Let us explain how throughout the years FLAX-LI-NUM has been responsible for many of the outstanding advances of building insulation . . how the material followed the method so that greater fuel economy . . and greater comfort could be achieved with an economical thickness of material.

FLAX-LI-NUM INSULATING COMPANY
St. Paul, Minnesota

Flax-li-num

A CORRECT BUILDING INSULATION AND SOUND CONTROL MATERIAL



FLAX-LI-NUM INSULATING COMPANY,
St. Paul, Minnesota

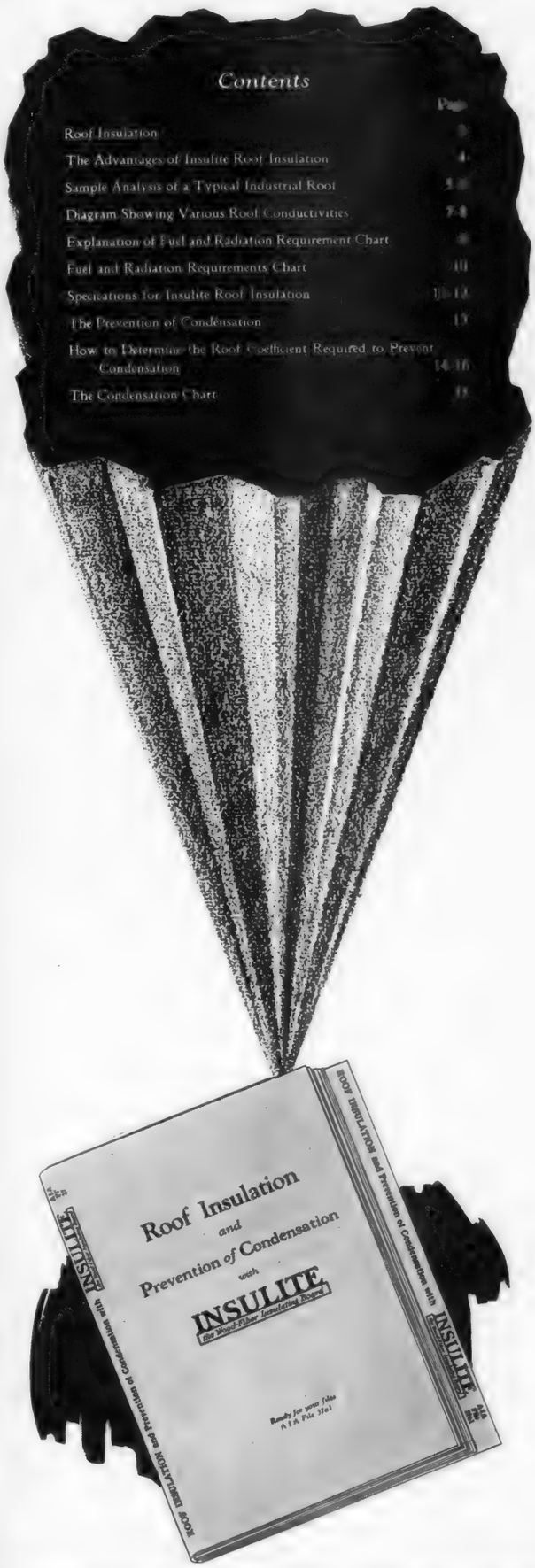
HV-5

Send me complete information about Flax-li-num. Also facts about the two-air-space method.

Name.....

Address.....

City..... State.....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INSULITE
Roof Insulation
and
Prevention of Condensation
with
INSULITE
the Wood-Fiber Insulating Board
Ready for your files A I A File 37a1

Answers to Insulation Questions

Note the Page of Contents from the portfolio—"Roof Insulation and Prevention of Condensation with INSULITE."

Ten chapters and charts that will be of great help in the solution of any roofing job in its relation to heating and ventilating.

INSULITE has unusual strength—great heat-resisting value—is easy to handle and work with. Not injured by moisture and exposure. Breakage waste is eliminated.

Send for your free copy of this portfolio.

The INSULITE engineering staff will be glad to give assistance in connection with any special heating problem you may have. No obligation.

INSULITE

the Wood-Fiber Insulating Board

THE INSULITE COMPANY

1204 Builders Exchange

Dept. No. 9

MINNEAPOLIS, MINN.

THE INSULITE COMPANY,
1204 Builders Exchange, Dept. No. 9,
Minneapolis, Minn.

Please send your Roof Insulation Portfolio to

Name.....

Address.....

City.....State.....

Insulate your air ducts *this way—*

You can provide much greater resistance to heat passage at lower cost with Celotex Industrial Insulation Board

ENGINEERS have found a new way to insulate metallic air ducts such as used for heating or cooling industrial plants and other large buildings. They specify coverings of Celotex Industrial Insulation Board.

The Results? Celotex gives more efficient insulation than most other forms of insulation commonly used for this purpose. It shows, in general, about fifty percent more heat resistance, thickness for thickness. And it costs less.

Celotex will give you these advantages and one more. It is easy to cut and fit to any normal size or shape of duct. It is easy to apply.

Celotex a standard insulation

Leading structural, heating and ventilating engineers have adopted Celotex Industrial Insulation Board as a standard insulating material. Here are a few of its major uses in addition to the one already described:

Celotex for—

Sound insulation
Dry kiln insulation
Tank and pipe line insulation
Drier, Oven, Tentering Machine insulation
Concrete form centering

Strong—tough—moisture-proof

This Celotex product is made from the long, tough fibres of cane, felted into rigid boards. It has strength, rigidity and resistance to compression (compresses less than 1¼% under a load of 720 lbs. per sq. ft.). It has greater compressive, tensile and torsional strength than non-structural insulating materials. Its strength, toughness and resistance to moisture insure retention of insulating qualities, despite the abuses such materials frequently suffer.

If you desire information about using Celotex Industrial Insulation on any particular job, our engineering staff will gladly consult with you. This service is free and puts you under no obligation.

The word
CELOTEX
(Reg. U. S. Pat. Off.)
is the trademark of and indicates manufacture by
The Celotex Company, Chicago, Ill.

THE CELOTEX COMPANY, Chicago, Ill.
Mills: New Orleans, Louisiana
Branch Sales Offices in many principal cities
(See telephone books for addresses)
Sales Distributors throughout the World
In Canada: Alexander Murray & Company, Ltd.
Montreal

CELOTEX
BRAND
INSULATING CANE BOARD
INDUSTRIAL INSULATION

How about the "EYE APPEAL" of your Burner?

ONE of the most widely advertised arguments for oil burners is that they make an additional room out of the cellar. But the attractiveness and usefulness of this room depend in large measure upon the *appearance* of the burner.

Copper and Brass always put up a good front. No other metals combine such outstanding beauty with technical advantages. Their use in both the manufacture and installation of burners adds considerably to "eye appeal" and to performance and durability.

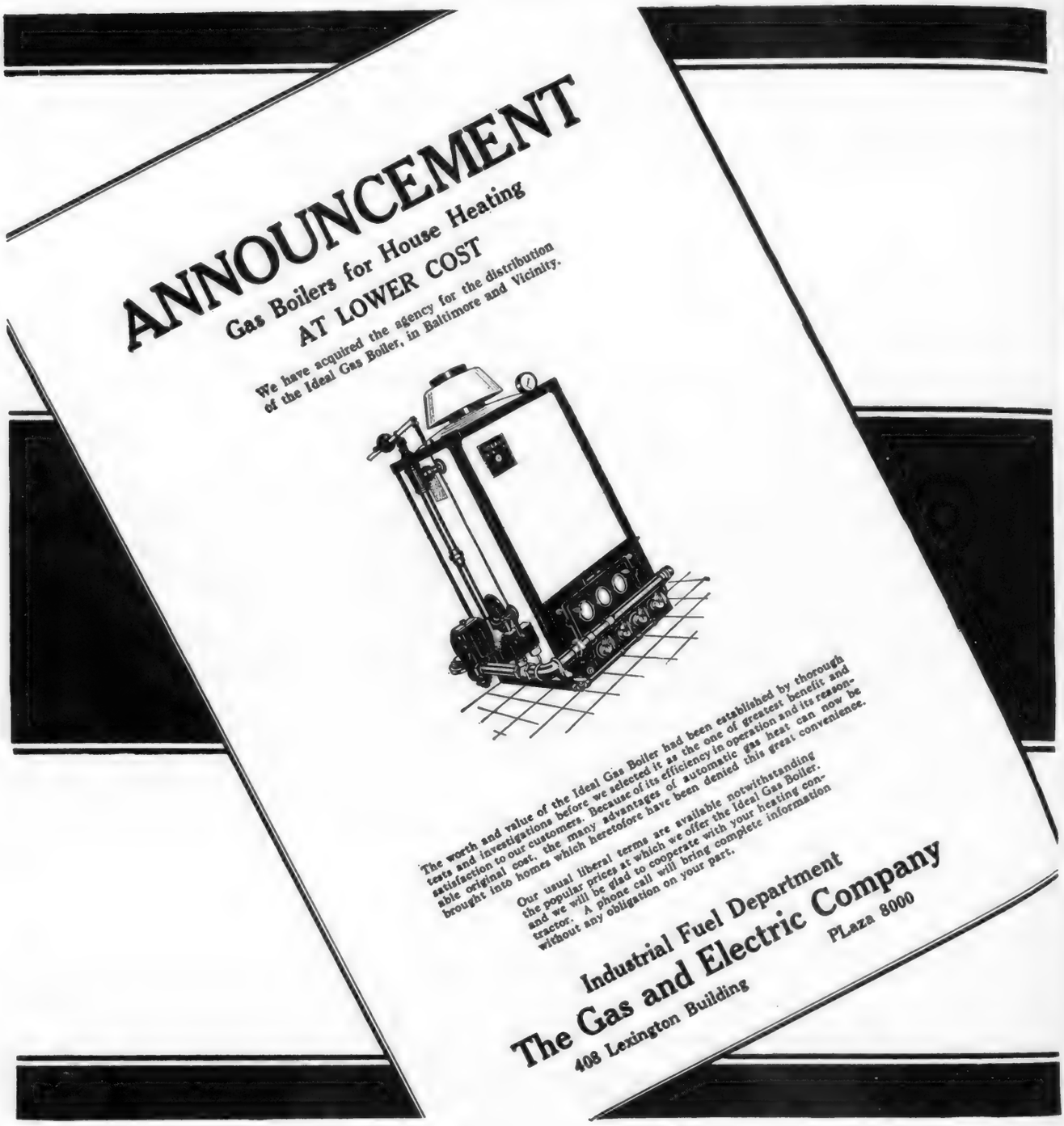
Detailed information about the application of these metals is contained in a new manual, "Copper and Brass for Better Oil Burner Installations," a copy of which will be sent you free upon request. Our Technical Department will be glad to advise you on any matters not covered in the booklet.

Write for copy of free book, "Copper and Brass for Better Oil Burner Installations."

COPPER & BRASS
RESEARCH ASSOCIATION
25 Broadway, New York, N. Y.

Midwestern Office: Landreth Building, St. Louis, Mo.
Canadian Office: 67 Yonge Street, Toronto, Ont.
Pacific Coast Office: Architects Building, Los Angeles, Cal.

COPPER, BRASS, BRONZE — *The World's Most Useful Metals*


ANNOUNCEMENT
Gas Boilers for House Heating
AT LOWER COST
We have acquired the agency for the distribution of the Ideal Gas Boiler, in Baltimore and Vicinity.
The worth and value of the Ideal Gas Boiler had been established by thorough tests and investigations before we selected it as the one of greatest benefit and satisfaction to our customers. Because of its efficiency in operation and its reasonable original cost, the many advantages of automatic gas heat can now be brought into homes which heretofore have been denied this great convenience.
Our usual liberal terms are available notwithstanding the popular prices at which we offer the Ideal Gas Boiler. and we will be glad to cooperate with your heating contractor. A phone call will bring complete information without any obligation on your part.
Industrial Fuel Department
The Gas and Electric Company
408 Lexington Building
PLaza 8000

This is a reprint of the advertisements run by

The Consolidated Gas Electric Light & Power Co. of Baltimore

in the Baltimore papers week of April 1st

AMERICAN RADIATOR COMPANY

For complete information on **IDEAL GAS BOILERS** write to —

AMERICAN GAS PRODUCTS CORPORATION

376 Lafayette Street, New York

You'll have COMPETITION under your THUMB

with this powerful new selling story to tell

THERE'S a mighty important change taking place in the heating industry. Only the most progressive heating contractors realize it; they're taking advantage of this change and thereby lifting themselves out of the scramble of competition and into a place in the merchandising sun.

The change going on is simply this. Thousands of fine homes, apartments and offices are being equipped with the Herman Nelson Invisible Radiator—a heating unit possessing so many advantages that competition is licked from the start.

The Herman Nelson Invisible Radiator fits behind the plaster of any standard wall or partition—completely out of sight and out of the way. It is leak-proof, rust-proof, indestructible. Which means—no more comebacks on the job—no more shrinking of profits after you've sold your customer.

You'll find it easy to get the choice contracts in your community, once you've installed a Herman Nelson Invisible Radiator job. Let your competitors battle on a price basis—get back of this unusual product and watch quality business come your way.

We'll gladly send you some interesting new facts about making money in the heating business. Just write your name and address in the coupon and mail it.

Radiator (1) comes installed in a steel case (2) more substantial than the wall itself. The complete unit is ready to install in any standard wall or partition.

HERMAN NELSON RADIATOR

HERMAN NELSON RADIATOR

For Steam, Hot Water, Vapor or Vacuum Heating

THE HERMAN NELSON CORPORATION, MOLINE, ILLINOIS

Builders of Successful Heating and Ventilating Equipment Exclusively for Over 20 Years

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THE HERMAN NELSON CORPORATION
Moline, Illinois

P'ease send me the illustrated book No. 33.

Name.....

Address.....

City..... *State*.....

Right: Fig. 350, Jenkins Radiator Gate Valve, with composition wheel.

You save time and labor

Accurate fitting, true dimensions, and exact threading of pipe ends are characteristics of Jenkins Valves that make them easy to install.

Besides making installation quick and easy—Jenkins Valves serve the heating contractor in another way also. Built strongly, they give trouble-free performance in existing installations and so make it unnecessary to take your men off new and paying jobs to take care of bothersome repairs.

Expert design, analyses-proved metals, accurate machining, painstaking assembly, rigid tests—all play a part in producing a valve that you can install with the utmost confidence.

Form 100 describes and illustrates the principal types of Jenkins Bronze and Iron Body Valves. Write to our nearest branch for a copy.

JENKINS BROS.

80 White Street, New York, N. Y. 133 North Seventh Street, Philadelphia, Pa.
524 Atlantic Avenue, Boston, Mass. 646 Washington Boulevard, Chicago, Ill.
JENKINS BROS., Limited, Montreal, Canada; London, England
Factories: Bridgeport, Conn.; Elizabeth, N. J.; Montreal, Canada

Jenkins
VALVES
Since 1864

Another Hospital Equipped with Haines Traps

H. Hall Marshall, Pettit & Ferris, Architects and Engineers.

J. N. Smith, Consultant.

V. N. Welamb, Heating Contractor.

Irwin & Leighton, General Contractor.

The New Hahnemann Hospital, Philadelphia

The new 20 story Hahnemann Hospital as well as the older buildings are HAINES equipped.

Haines Traps mean economy and satisfaction for the small as well as the large heating installation.

WILLIAM S. HAINES & COMPANY, Philadelphia

IMPROVED

FEDERAL

BRASS GATE VALVE

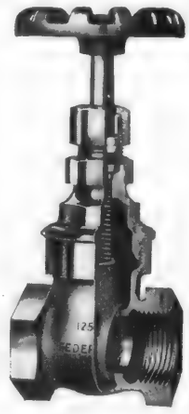
Larger, Stronger Hexes

Increased End to End Dimensions

Longer Bonnet Thread Connection

Milled Hexes

Longer Stem



Sectional View showing how metal is distributed for maximum strength.

EVERY ONE IS INDIVIDUALLY TESTED

Greater strength where strength is essential has been built into the improved Walworth Federal, a sturdy, rugged valve for 125 lbs. working steam pressure and 175 lbs. hydraulic pressure. Bigger hexes do away with the danger of springing or bulging when pipe is screwed tightly into the valve. The hexes are milled, adding materially to the appearance of the Federal.

Increased strength where body and bonnet join has been obtained by increasing the length of bonnet thread and the width of the supporting band on the valve body. End to end dimensions are longer to provide adequate engagement of pipe threads and to increase the clearance between the end of the pipe and the valve seat, thus avoiding any danger of distorting the valve seat by screwing the pipe too far into the valve. A longer stem facilitates repacking. Finally, new and improved machine and gauging equipment assures closer working tolerances between adjacent parts.

The Walworth Federal is of the wedge gate type with a gland in the stuffing box, and a non-rising stem. Every individual Federal is tested before it leaves the factory.

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Walworth Company, General Sales Offices: 51 East 42nd St., New York
Plants at Boston, Mass.; Kewanee, Ill.; Greensburg, Pa.; and Attalla, Ala.
Distributors in Principal Cities of the World
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LINCOLN BUILDING (Fifty-three Stories)
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Architect

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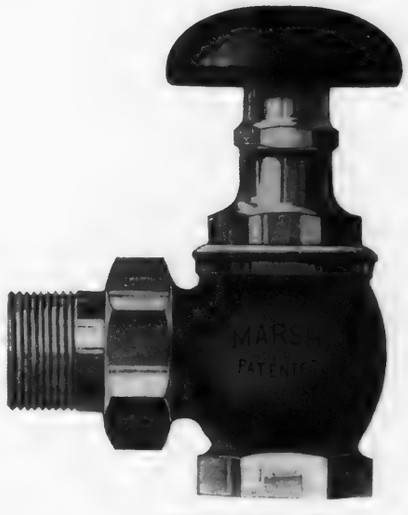
Engineer

Dwight P. Robinson & Co., Inc.
General Contractors

Baker, Smith & Company
Heating Contractors

MARSH
PACKLESS VALVES
Fig. 133
used throughout on this job



Packless Fig. 133

MARSH VALVE COMPANY

DUNKIRK **NEW YORK**

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Edward T. Hetherington
1709 Sansom St., Philadelphia

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United States Radiator Corp'n
General Offices: Detroit, Mich.

SARCO COMPANY, Inc.
183 Madison Ave., New York

Taylor-Forbes Company
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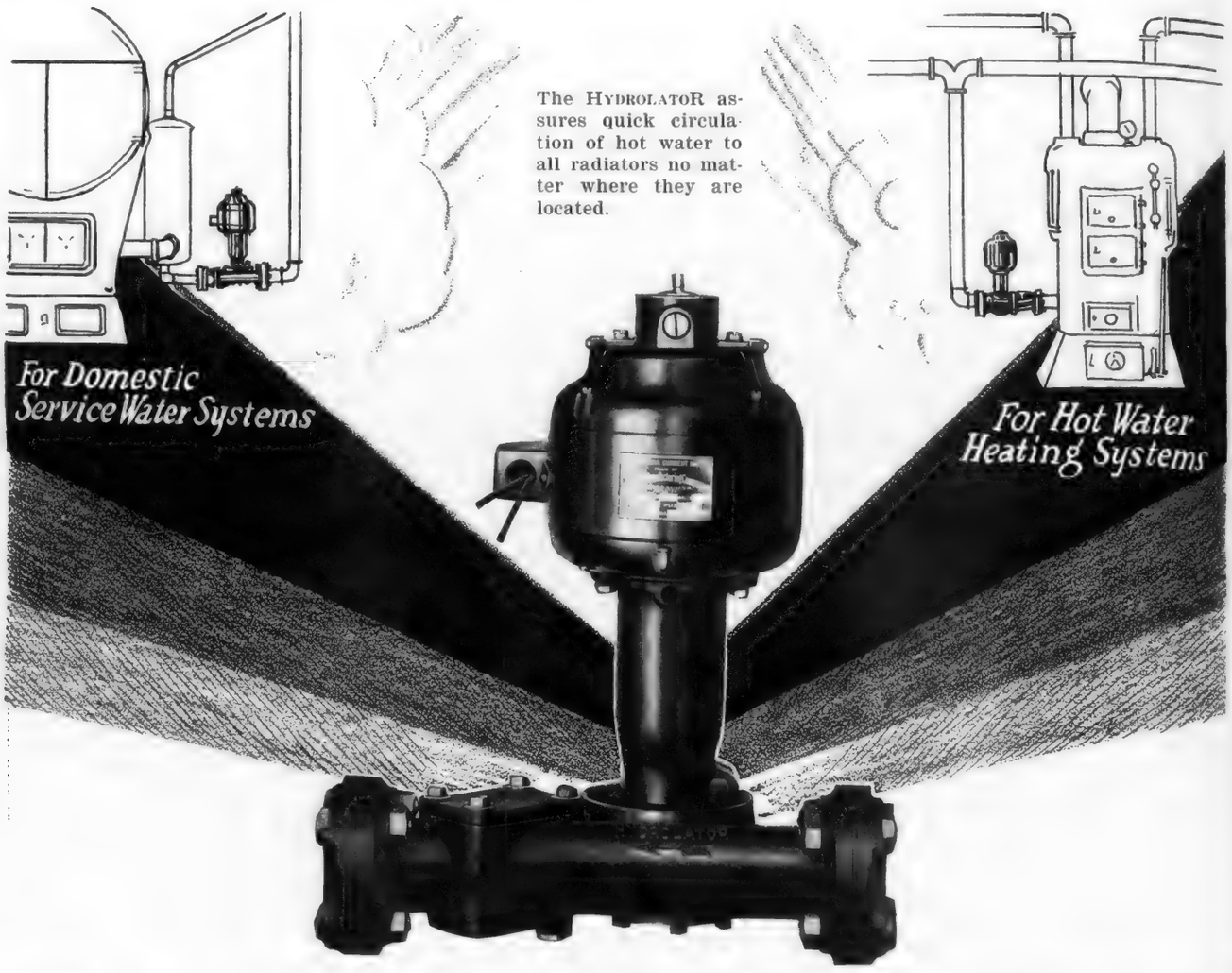

The HYDROLATOR assures quick circulation of hot water to all radiators no matter where they are located.

IN SPRING

The Heating Contractor's Fancy Turns to Thoughts of "Sick" Hot Water Jobs

And well it may—for with thoughts of "sick" hot water jobs come thoughts of profitable HYDROLATOR installations.

Hundreds of these units were installed by eager home owners during the cold winter months. More, naturally, will go in now that the weather has moderated, opening up a big new field for spring profits.

THE HYDROLATOR corrects practically all forms of hot water circulation troubles — sluggishness, short-circuit, traps, etc. Indispensable on jobs with long horizontal pipe runs or where radiators are on a level with, or below, the boiler. Makes circulation rapid and positive. Raises boiler efficiency—lowers fuel costs.

Write for Bulletin 828-H

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There Is Only One
HYDROLATOR
REG. U.S. Pat Off

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ROBRAS 20-20 Radiators installed 4-sections deep, 1-tier high, in an office in the N. W. Ayer building, Philadelphia, Pa.

William M. Anderson, Philadelphia, Pa., Heating Contractor.

ROBRAS 20-20 Radiators Throughout *and Why!*

BECAUSE this building must be modern in *all* equipment, ROBRAS 20-20's were used. Must be modern because it was built to house a modern business, the advertising agency of N. W. Ayer and Company.

Old-fashioned radiators were no more to be tolerated than gas lighting. "Be modern," said the heating contractor, "use ROBRAS 20-20 Radiators."

These radiators are installed in-the-walls, out-of-sight and out-of-the-way. On their comparative rating they are 20% the weight and 20% the size of cast iron radiators.

This means saving in installation and handling costs, which makes your profit greater.

We will be glad to send you installation data and price lists.

ROME BRASS RADIATOR CORPORATION

ONE EAST FORTY-SECOND STREET :-: :-: NEW YORK CITY

What Is Your Franchise Worth?...

. . . is it an Asset?
. . . is it Worth Money?

NOT long ago the Dodge dealer in a large Eastern City decided to retire from business and take life easy. He is reputed to have made more than a million dollars out of his retail automobile business. He had a large number of applicants for his franchise and when he finally did sell, he received full value for all cars, parts, used cars, machinery, fixtures, etc., and *for his franchise he received $50,000.*

The probabilities are that you, too, know of similar cases. No doubt you are personally acquainted with men who had an opportunity to acquire the sales franchise for Buick, Hudson, Dodge, Packard, Cadillac, or some other well-known automobile in the early days of that industry. You are then perfectly familiar with the opportunities that were literally thrust upon these men, and the fortunes these dealers made for themselves.

Some Franchises Are Worth More Than Others

The opportunities today for dealers in the oil burner business are even greater than they were two decades ago for dealers in the automobile industry. The oil burner industry is much further advanced after its first ten years of existence than were automobiles in the same period of time. But just as some automobile dealers realized that some franchises were worth more than others, so are some oil burner dealers discovering that certain oil burner franchises are more valuable than others. The reason for this is very simple,—a few manufacturers are doing more to build a sound and stable dealer organization than are others. They are working closely with their dealers along merchandising lines and helping build a profitable business for each and every one handling their particular product.

All of which has a very direct influence on the value of a particular selling franchise. Space does not permit, nor is this the place to go into the details of what THIS COMPANY is doing to establish a greater dollars and cents value to the franchises that have been granted to its hundreds of dealers. Suffice it to say that a definite money value has been established in the possession of a QUIET MAY franchise.

What Is Your Franchise Worth?

RIGHT NOW—how much is *your* franchise worth? What is being done by the manufacturer whose product you represent to see that you get a chance to participate in the fortunes that will be made in this industry.

The May Oil Burner Corporation has worked out a Profit Sharing Plan, whereby its dealers can get a direct share in the factory earnings. This is in addition to the substantial profits that are already being made by many QUIET MAY dealers out of their retail business.

This is just one of the many advantages of having a QUIET MAY Franchise. Why not get the complete story. Regardless of your present connections, get the details of the QUIET MAY Franchise.

MAY OIL BURNER CORPORATION

BALTIMORE, MARYLAND

OFFICES:

NEW YORK	CHICAGO	BOSTON
331 Madison Avenue	35 East Wacker Drive	89 Federal Street

Even before this remarkable increase in capacity

—*Trane Unit Heaters were in the front rank of sales*

Now, with 40% to 50% added capacity as announced last fall — at practically no added cost, and with all former features retained — Trane Unit Heaters offer a combination of quality and low cost previously unknown in the heating field.

In detail, the improvement is simple. Smaller steam tubes and more of them—a new header construction borrowed from the boiler industry, for absolute insurance against expansion and contraction leaks—but the result is far-reaching. It means that this high-quality equipment now meets any price competition, of whatever quality, in the unit heating field. Pressure range 2 to 150 lbs. on standard models.

This drastic improvement is a logical result of the Trane policy: To let no measure of present success stand in the way of giving heating men still better Trane products. In the manufacture of Trane Pumps, this policy of engineering research has created new standards of pump efficiency, represented by a dollars and cents saving on power cost of 25% to 40%. ¾ H. P. motors do work that formerly required one or 1½. On the larger units that formerly required 10 H. P., 7½ H. P. is sufficient. On the Condensation Pump there is a further saving in installation cost— a reduction of $10 to $20 in electrician's fees because the complete unit, with switch and motor protective equipment, is mounted on one base and wired at the factory. Only the hook-up of feed wires remains to be done on the job.

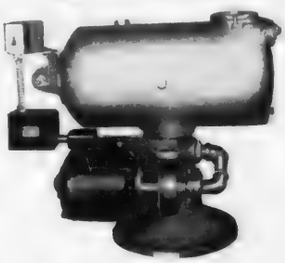
Trane Products include practically every part of a heating system except the boiler and piping. Investigate the latest Trane achievements before you buy or recommend heating equipment.

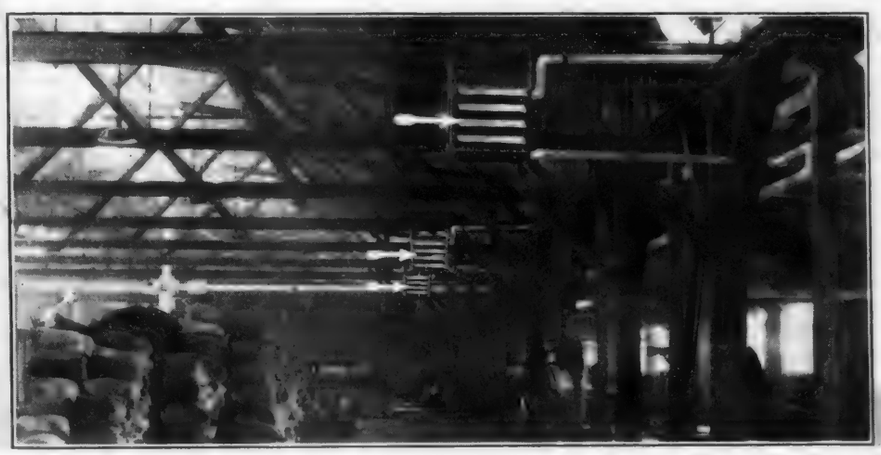
THE TRANE CO., *Dept. 5,* 206 Cameron Ave., *La Crosse, Wis.*

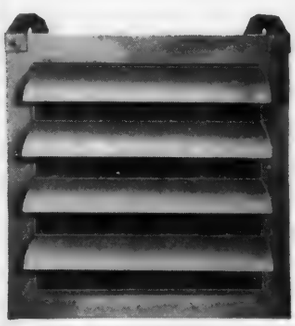
Trane Quick Vent

Trane Float Vent

Trane Condensation Pump

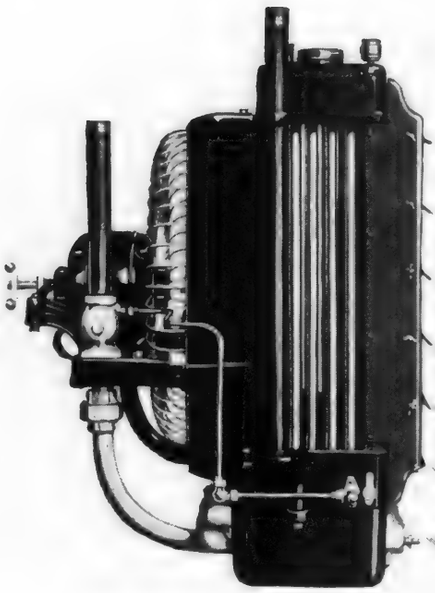






HEAT CABINETS **TRANE** CONCEALED HEATERS

PUMPS, UNIT HEATERS, AND HEATING SPECIALTIES



It Burns GAS

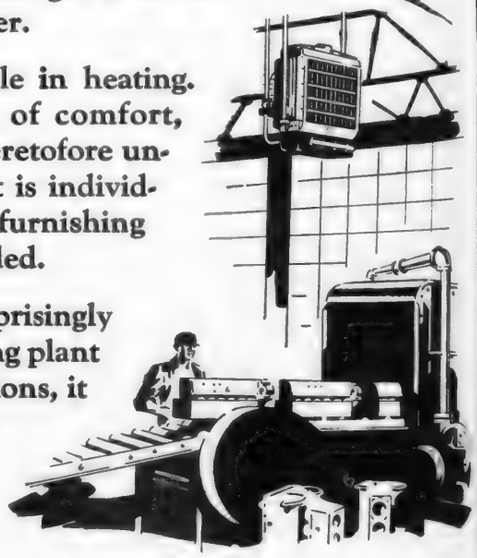
Economy and Efficiency for INDUSTRIAL HEATING

No expense for firemen.
No time lost getting up heat.
No boilers to clean.
Increased cleanliness.
Separate control of individual departments.

Directed heat, warming every part of the building as needed—that is what you get with the Humphrey Industrial Unit Heater.

The Humphrey is a new principle in heating. It burns gas and gives a degree of comfort, efficiency, economy and elasticity heretofore unknown in a heating unit. Each unit is individually and automatically controlled—furnishing instant heat when and where it is needed.

The *Humphrey* is simple to install and surprisingly economical to operate. No central heating plant required. Ideal for new building installations, it cannot be excelled for auxiliary heat. Let us send our new catalog describing this modern method of industrial heating.



The Humphrey Industrial Unit Heater

GENERAL GAS LIGHT COMPANY, KALAMAZOO, MICHIGAN

New York, 44 W. Broadway

San Francisco, 135 Bluxome St.

SLYKER

False Theory Exploded!

Recent Test Proves SLYKER Enclosures More Efficient Than Bare Radiators

A RECENT test has proven conclusively that certain types of metal radiator enclosures increase radiator efficiency and room comfort.

This test was impartially conducted by a competent authority fully recognized by Heating Engineers, Contractors and the heating industry.

The test report, which was read before the American Society of Heating and Ventilating Engineers, stated that Enclosure No. 3, Figure 10, "was *unquestionably superior* to the bare radiator both from the standpoint of air temperature conditions in the room and of steam economy."

In commenting further on the performance of the enclosures, the report states "——— it is evident that the most satisfactory combination of all the factors involved was obtained with enclosure No. 3."

"Since the degree of comfort produced is probably the final criterion for judging the performance of any given heating unit, the mean temperature in the zone from the floor to the breathing level is the most important factor involved.

"The highest mean temperature below the breathing level was obtained with enclosure No. 3." The enclosure referred to as enclosure No. 3, Figure 10, is the SLYKER Enclosure illustrated on this page.

This report is all the more astonishing when we consider that these results were obtained without making any use whatever of the humidifier which is a patented feature of every SLYKER Radiator Enclosure.

Heating Engineers, Architects and Heating Contractors who are interested in giving their clients the utmost in heating comfort are invited to write us for a copy of this report and complete information on SLYKER Radiator Enclosures.

Results of Test — Table No. 1

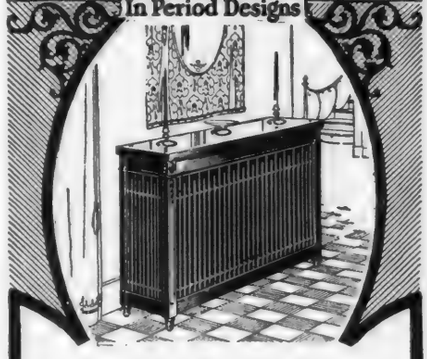
Enclosure No.	Type Fig. No.	Performance Fig. No.	Temp. at Breath. Level Deg. F.	Diff. in Temp. Ceiling-Floor Deg. F.	Mean Temp. below Breath. Level Deg. F.	Net Condensed Steam Lb. Hr.
Bare	9	14–17	69.4	21.8	62.0	5.44
3*	**10**	**14**	**69.5**	**18.2**	**63.6**	**4.71**
10	11	15	66.2	23.0	57.8	4.50

*NOTE: Enclosure No. 3 is the SLYKER Enclosure illustrated.

Specify SLYKER for Increased Room Comfort and Greater Heating Efficiency

SLYKER *Metal* RADIATOR FURNITURE

In Period Designs



Illustrating "Enclosure No. 3, Figure 10"—The Rod Grille Type Enclosure by Slyker which was used in the authoritative tests referred to on this page.

SCHLEICHER, *Inc.*

Manufacturers of Slyker Metal Radiator Furniture

Factory: GARY, INDIANA

SLYKER Showrooms in Principal Cities of U. S. A.

20 Horse Power Century Type SCN Squirrel Cage Induction 3 and 2 Phase 60 Cycle Motor

Low Starting Current

Normal Torque . . . General Purpose

When a Century Type SCN Squirrel Cage Induction 3 and 2 Phase Motor is thrown directly across the line, in 30 horse power and smaller sizes, the starting current is within N. E. L. A. recommendations . . . The starting torque of the Type SCN Motor is practically the same as that of the standard Type SC Motor.

Therefore, Century Type SCN Squirrel Cage Induction Motors are particularly suitable where a normal starting torque is satisfactory, and less starting equipment is desirable.

Built in standard sizes from 7½ to 75 horse power. Temperature rating, 40° C.

Century Type SCN Motors, 30 horse power and smaller sizes, are more economical to install and maintain—because they require no current-limiting starting equipment . . . They take full advantage of the current drawn from the line, because no current is dissipated in starting equipment . . . Line disturbances are lessened.

CENTURY ELECTRIC COMPANY

1806 Pine St. St. Louis, Mo.

40 U. S. and Canadian Stock Points and More Than 75 Outside Thereof

Century MOTORS

"THEY KEEP A-RUNNING"

Architects:
(for the building)
Albert Kahn, Inc.
Detroit
(Theatre)
Graven & Mayger
Chicago
Heating and Ventilating Contractors:
Johnson, Larson & Company
Detroit

ILLINOIS
HEATING SYSTEMS

ILLINOIS HEATING SYSTEMS

THE NEW Fisher Building in Detroit, from a standpoint of equipment and quality of equipment used, is probably the finest piece of architecture in the United States.

It is significant that the entire building is equipped with ILLINOIS Radiator Traps on direct radiation and ILLINOIS Combination Blast Traps on the ventilating equipment and main drip line.

ILLINOIS Thermo Traps, selected for this building have the longest record of successful use of any trap now on the market. Specifying ILLINOIS Heating Equipment gives unified responsibility and positive guarantees.

Write for Bulletin 22

ILLINOIS ENGINEERING COMPANY

ROBT. L. GIFFORD. PRES. **INCORPORATED 1900**
BRANCHES AND REPRESENTATIVES IN 40 CITIES
CHICAGO

McAlear No. 866 Simplex Water Feeder with Low Water and Pressure Cut-out Switch.

FOUR BOILER PROTECTIONS *in* ONE UNIT *for* oil-fired boilers with

McAlear Combination Water Feeder and Controller

THE first requisite for positive boiler protection is a reliable Water Feeder, to insure ample water for the boiler at all times. McAlear Water Feeders feed water direct to the Boiler and discharge surplus water to sewer. McAlear Water Feeders are provided with a simple, frictionless valve constructed of non-corrosive materials. For Oil-Fired Boilers —There is only one sure way of protecting the boiler against damage from low water and that is by installing the McAlear combination Water Feeder with low water or low water and pressure control—as many as four protections in one unit.

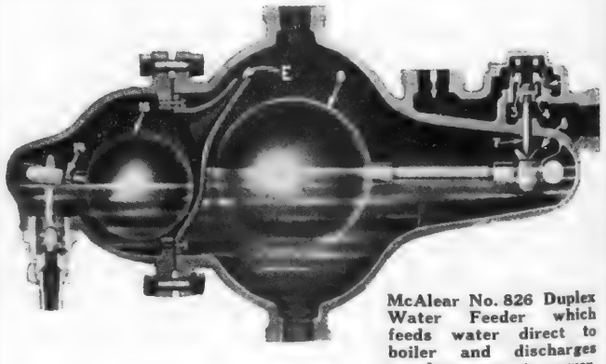
Let us send you our latest prices and quantity discounts and show you why these units cost no more than ordinary feeders.

The McALEAR MFG. CO.

1901-7 South Western Ave., Chicago, Ill.

Offices in Principal Cities

McALEAR WATER FEEDERS



McAlear No. 826 Duplex Water Feeder which feeds water direct to boiler and discharges surplus water to sewer.

The Heating & Ventilating Magazine

Volume XXVI

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Reg. Canadian Pat. and Copyright Off.

Number 5

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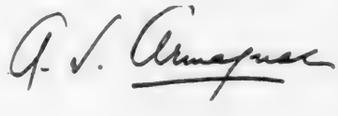
Our Silver Anniversary

NEXT month THE HEATING AND VENTILATING MAGAZINE will have completed its twenty-fifth year of publication. Most of us have witnessed or have participated in silver anniversaries, but to have one of your own is another matter. Our first feeling is one of pride in the fact that we have reached the quarter-century mark so successfully. At the same time, we realize to the full how much of the success which has come to us is due to the generous support, through the years, of the men who have been making the industry what it is today.

We can think of no better way to celebrate the occasion than by devoting our June Silver Anniversary Issue to the evolution of heating and ventilation during this eventful period. It is a stirring story, written for the most part by the men who played leading parts in the events they describe. Their articles, we predict, will go down to posterity as important contributions to the history of the art.



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180 Madison Ave., New York; Helmle & Corbett, and Henry I. Oser, Architects; Raisler Heating Co., Heating Contractors.

Textile Trade Uses SARCO Radiator Traps

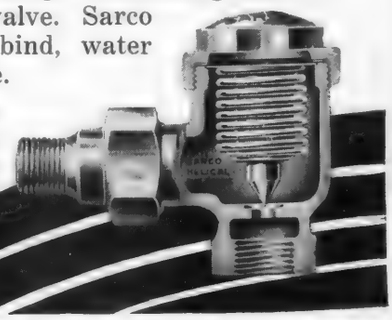
THIS 23-story building, designed especially to meet the peculiarly exacting requirements of the textile industry, is equipped throughout with Sarco Radiator Traps.

In selecting Traps for your next building, why not consider these important advantages of the Sarco.

They are unusually long lived because the metal in the expansion element is stressed less than in ordinary constructions.

The wide open movement of the valve provides free discharge at all times. No steam or vapor can enter the return. Maximum closing pressure and perfect setting insure a positively tight valve. Sarco Traps will not bind, water hammer or freeze.

Other advantages are explained in Booklet P-110. Send for a copy.



SARCO CO., Inc.

183 Madison Ave., New York, N. Y.

Boston Chicago Detroit Pittsburgh
Buffalo Cleveland Philadelphia St. Louis
Peacock Bros., Ltd., Montreal

A Good Heating System

A MONTHLY JOURNAL OF ENGINEERING PROGRESS

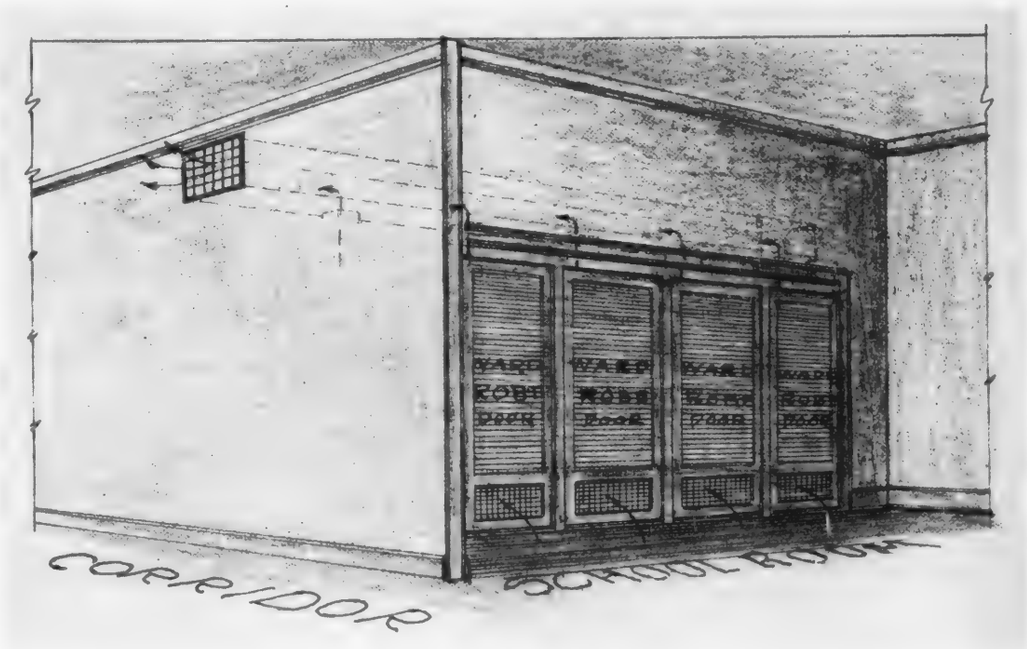
The Heating & Ventilating Magazine

Volume XXVI MAY—1929 Number 5

Corridor Venting of School Buildings

By Samuel A. Challman

State Director of School Buildings for Minnesota



Corridor Venting Through Wardrobes and Into Corridor at Ceiling Line

EVERY system of ventilation, in order to produce required results, must recognize at least three primary requirements. These are:

1. An inlet through which a wholesome air supply may be obtained without causing discomfort to the occupants of the room.

2. An outlet through which a sufficient quantity of air may be removed so as to facilitate a proper movement of air in the room.

3. A location of these inlets and outlets so arranged that in passing through the room air is distributed to all parts as evenly as possible.

These considerations may seem so elementary in their application to the problem of ventilation that it might be considered unnecessary even to refer to them. But in considering the venting of school buildings each of these three factors affects the problem in a marked degree. Every outlet is dependent upon a corresponding inlet and it is further conditioned upon its location with reference to the inlet.

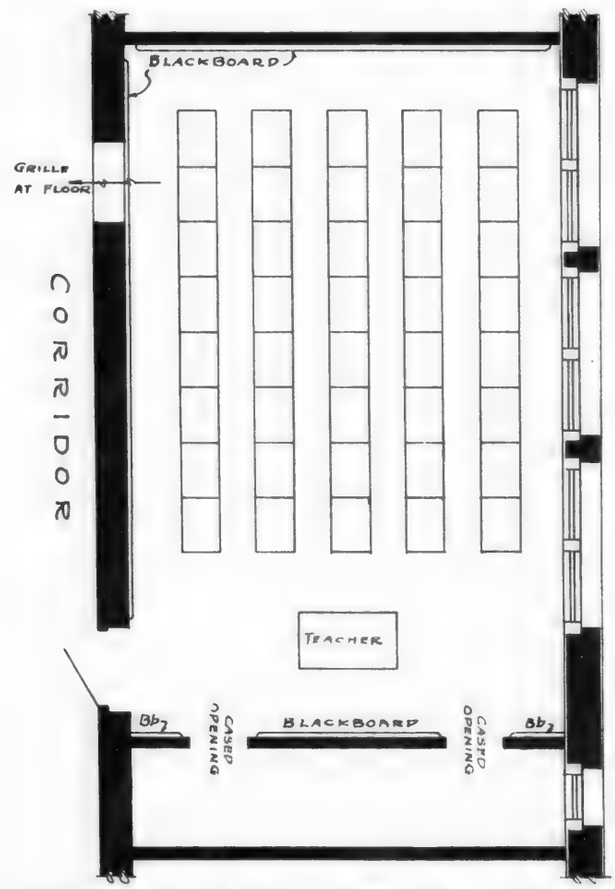
It is well to bear in mind that there are three ways by means of which air may be removed from schoolrooms:

1. An individual vent flue, with an opening *at the floor,* extending upward through the roof, either separately or in conjunction with flues from other rooms, and capped by a roof ventilator.

2. An individual vent flue, with an opening *at the ceiling,* but otherwise as described above.

3. An opening in a partition or a louvered door between a schoolroom and the corridor so located as to draw the air off the floor of the schoolroom into the corridor, where it rises in the stairwell to the ceiling of the top story and escapes through a flue extending from the ceiling to a roof ventilator.

The first of these methods is customary with the central fan system, but not essential. The second is restricted to the Wheeler window system, espoused by the New York Commission of Ventilation. The third was devised by manufacturers of the unit cabinet ventilating system and is generally referred to as "corridor venting."



Corridor Venting by Means of Grille at Floor. Grille Can Be Omitted and Louvers in Door Substituted

This method of venting has met with considerable opposition and still is subjected to vigorous criticism. The chief arguments against this method may briefly be summarized as follows:

1. A window raised in any room below the top floor results in making this room the vent for all the rooms on the same floor and for those on floors below.

2. Windward rooms carry excess pressure and cause them to exhaust through leeward rooms. Despite endeavors to insulate buildings, outside air still penetrates the walls. The windward classrooms receive much infiltration of air and the vents show a greater quantity of air escaping through the outlets than is supplied by the inlets. Leeward classrooms, on the other hand, show less outlet air than inlet.

3. Corridor venting results in smelly corridors. There is also a humid, fetid condition of the air noticeable in classrooms when the air pressure materially is reduced.

4. Corridor venting is not so conducive to health as the individual flue system. It is merely another form of uncontrolled ventilation, conforming to no particular standards, producing no definite results and constituting no appreciable economy when compared with a properly-controlled system. Generally speaking, the venting of classrooms by other means than individual flues with their outlets at the floor is very inefficient.

5. Corridor venting constitutes a decided fire hazard, as smoke is carried directly into the corridor through the outlet grille and up the stairway, thus confusing the children who are attempting to use the stairways in their efforts to escape from the building.

6. The noise of traffic in the corridor is carried into the classroom and constitutes a distracting influence.

Proponents of Corridor Venting Claim It Has Numerous Distinct Advantages

The proponents of corridor venting not only challenge the correctness of the arguments advanced, but also assert that this method of venting has certain advantages not possessed by the individual duct system. Taking up the objections in the order in which they are presented, their rejoinder is:

1. It would be a most uncommon occurrence to find an open window which would become an outlet for a whole floor, as well as for floors below it. As long as the room is under pressure, only air from the room itself can be vented through the open window. When this pressure is removed it is conceivable that some air may be drawn from adjoining space. But this is true of any form of vent outlets and is not peculiar to corridor venting.

With the individual vent flue it is not unusual to find the air coming down the flue as soon as the fan stops and the pressure is removed, particularly when a window is open or the door to the corridor stands open or ajar. To counteract this recreant

performance on the part of the vent flue, an aluminum back pressure damper often is used.

If such a damper were used, with an outlet for a corridor vent, it would effectively stop any reversal of air currents through the outlet. But it should be remembered that, except in mild climates, windows are not desirable as vent outlets. For the reasons given, therefore, the use of the window as a vent outlet is neither efficacious nor desirable.

2. Assuming the correctness of the statement that windward rooms carry excess pressure and cause them to exhaust through leeward rooms, it should be remembered that this applies with equal force to any other method of venting. It is not the small opening in the partition or the louver in the door that is responsible for a greater amount of air escaping from the leeward rooms, since this situation also exists in rooms vented by flues.

At the same time it is not uncommon to find, with any method of venting, that, on days when there is no perceptible wind, only about half the amount of air entering through the inlet is carried away through the outlet. This argument, therefore, is of no particular significance as an objection to corridor venting.

3. Corridor venting should not be held responsible for smelly corridors, nor for any fetid condition of the air in the classroom. If the air pressure in the classroom is positive, any air vented into the corridor rises toward the ceiling and ascends up the stairwells, until it reaches the ceiling outlet. It does not linger about the breathing plane of the corridor.

If there is any fetid condition of the air in the classroom, while the air pressure is on, this probably is due to soiled clothing or personal neglect.

In almost all schools in which the split system is used and individual flues provided, the corridor air at the breathing level soon becomes stagnant and stifling, due to the fact that no provision is made for moving this air. This condition of the air is quite noticeable the first few minutes after classes have all passed to their respective rooms and the corridor is clear.

4. The charge that corridor venting is not so conducive to health as the individual vent flue system may rest upon the assumption that disease germs are carried by the air from one person to another. This assumption, however, is not supported by the medical profession.

S. Josephine Baker, M. D., of New York, who has given much thought and study to the subject of ventilation in schools, says in her book on "Child Hygiene," page 333: "Contrary to general opinion, germ diseases are not, except to a limited extent, air borne. The infectious germ or material usually finds its entrance into the body through the mouth and the nose."

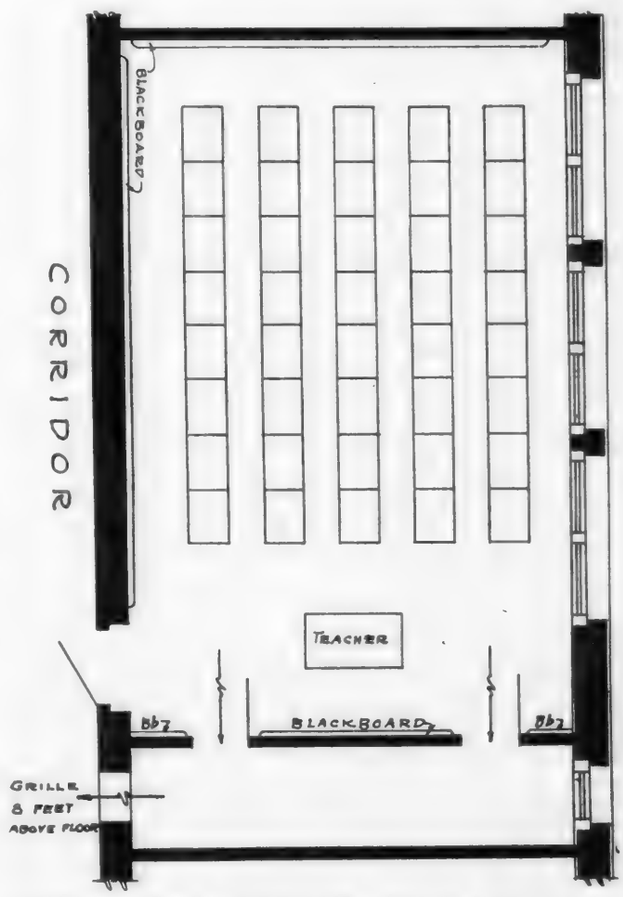
Besides, it should be remembered that doors to schoolrooms are opened many times a day, and that if there should be any air in the schoolroom detrimental to the health of the children or the teacher, some of it is bound to escape to the corridor whenever the door is open.

Corridor venting, therefore, is not the only means by which air from the schoolroom reaches the corridor. Other objections to corridor venting also may be ascribed to the fact that the air has been vitiated and, in consequence, is detrimental to health.

With reference to this, Dr. George T. Palmer, epidemiologist of the Department of Health of Detroit, Michigan, says in an article on "Modern Tendencies in Ventilation Practice," published in Vol. 29, Transactions A.S.H. & V.E., the following: "The best of experimental evidence shows that the chemical constituents of vitiated air of ordinary occupied rooms are innocuous to health, and until evidence is produced to the contrary, it is entirely logical and scientific and a matter of common sense to abide by these findings."

Classifying corridor venting as uncontrolled ventilation merely is an unsupported statement, as the system can be shown by smoke tests to bring about a well-defined vertical rise with smoke spreading along the ceiling and moving in the direction of the open stairwell. From thence it rises to the top story and finds its outlet at the ceiling of this story. Considering the amount of air drawn off by corridor venting, as compared with individual vent flues, there appears to be no material difference.

5. That corridor venting constitutes a fire hazard often has been asserted. As to the validity of



Corridor Venting Through Coat Room. Grilles in Lower Panel of Coat Room Doors and in Partition 8 Ft. Above Floor

this assertion, the ruling of the insurance rating bureaus very likely would be the most authoritative. Some of these bureaus are reported as increasing the fire insurance rates approximately 5% where corridor venting is used; others make no increase in the rates, whatsoever.

The General Inspection Bureau fixing fire insurance rates in Minnesota, North and South Dakota ruled in 1927 that corridor venting in schools is not objectionable. In making this ruling the bureau explains its position in the following manner: "From our standpoint there would be two effects to be considered, first, the possible spread of fire, or the effect of the corridor venting system on the possibility of controlling a fire; second, the danger of corridors filling with smoke and interfering with the escape of persons from the building.

"Both situations seem to be well taken care of by the corridor venting system, and in this connection it would seem that the vital point would be to have a sufficient number of stairways and vents of adequate size so that any accumulation of smoke can easily be disposed of. In view of this there would seem to be no real objection to the corridor venting system."

So far as insurance rates are concerned, even with a flue system where the same opens into attic space or combustible plenum chambers in the attic, there is an increase in rates; some bureaus even consider the risk greater where exhaust air is carried off at a high velocity in flues of small area, as is generally the case with individual vent flues.

As a matter of fact, it would appear that flues of small area almost certainly would create a situation where smoke could not be carried off rapidly enough and, in consequence, confusion would ensue.

It is worthy of note that the Building Code of the National Board of Fire Underwriters, in order to obviate any such accumulation of smoke on the stage of theaters, makes the following recommendation: "Automatic ventilators or skylights, which are controlled by fusible links, located at different points in the shaft are recommended. Such devices, if arranged to open very surely upon fusing of a link afford quick release of smoke and hot explosive gases."

But there is still another situation to consider, in endeavoring to determine the extent of the fire hazard. When a fire starts in a school building, the first consideration is the saving of the lives of the children and the teachers. All doors to corridors will be thrown open as soon as the gong signals a fire and will remain open until the fire has been checked, unless the building is consumed.

With the doors open, it matters little whether there is a corridor venting system or a vent flue system, the smoke will pour through the doorway into the corridor and unless there is a chance for it to escape at the ceiling of the top story it will fill the building and pour through any wall opening.

The question, therefore, of a fire hazard appears to be about equally grave, no matter what system of venting is used.

6. When it comes to the noise of traffic, there is no question but that this constitutes a disturbing element. There practically is no way to shut out noise in the corridor from the schoolroom. Singing in one room will readily be heard in an adjoining room, and teachers in general speak of this as the greatest objection to the corridor venting system. There seems to be but one way to overcome this and that is to arrange the daily program in each of the rooms so that noise and music, while heard, may not interfere with the work that is being done.

Additional Advantages Claimed for Corridor Venting

But in addition to combating the objections above referred to, the champions of corridor venting claim:

1. That a substantial economy is effected by eliminating all vent flues except in rooms where their use clearly would indicate that they constitute a necessity.

2. That the cost of heating corridors is very much reduced by using the air from the classrooms and that in addition the corridors are ventilated. With the split system or the Wheeler system no corridor ventilation is attempted.

3. By a proper location of inlets and outlets, with outlets of smaller area than has been customary with any other system, and by delivering air at a high velocity against the ceiling of the room, a better distribution of air is obtained in the classroom than is possible with either the central fan system or the Wheeler system.

4. Corridor venting obviates down drafts which frequently occur in the usual type of vent flues when the fan is not in operation.

With all of the above information before it, the State Board of Education of Minnesota adopted the following regulations in June, 1928, permitting corridor venting in the public schools of Minnesota:

"1. All classrooms and other rooms used for purposes of study or recitation and for which an individual vent flue is not hereafter specifically required by these rules may, when such rooms are equipped with a central fan system, a unit ventilating system, or a warm-air blast system, be vented either through a separate vent flue or through an adjoining corridor.

"The free area of the vent opening between the room and the corridor may not exceed 18 sq. in. for each 100 cu. ft. of air introduced into the room through the air inlet. The location of this opening shall be conditioned upon obtaining as satisfactory results from this form of venting as from individual room vent flues.

"For such corridor venting it is required that there shall be an adequate opening or openings in the ceiling of the top story with a flue extending from the ceiling to the ventilator on the roof. Suitable grilles are required for all ceiling openings, and flues are to be provided with dampers.

"2. Chemical laboratories, food laboratories,

kitchens, cafeterias, laundries, gymnasiums, natatoriums, shops, shower rooms, locker rooms in connection with gymnasiums and natatoriums, toilet rooms, and other rooms from which noise, odors, or dust might be vented into the corridors shall be equipped with vent flues which must extend through the roof, independent of flues from corridor vented rooms.

"Each flue shall be built in such a manner as to insure a positive upward current while such rooms are in use. Toilet rooms shall have openings covered by grilles in their vent flues, both at the floor and at the ceiling, except that in case of toilet rooms heated by warm air, the opening to the vent flue shall be at the floor only."

Minnesota was the first state in the Union to recognize in its rules the use of corridor venting. Unless some other state recently has passed similar regulations, it remains as the only state at the present time that has given official approval to such a system. Before taking such action, however, corridor venting was subject to a number of tests, and the opinion of engineers of national reputation obtained. The following are a few of the opinions expressed:

"I can see no possible objection to corridor venting. If air is bad for any reason, when it enters the corridor, it must also be bad when it leaves the classroom. Any system of ventilation is a failure which allows this condition to prevail. If classrooms are properly ventilated there can be no objection to venting them through corridors, stair halls, etc."

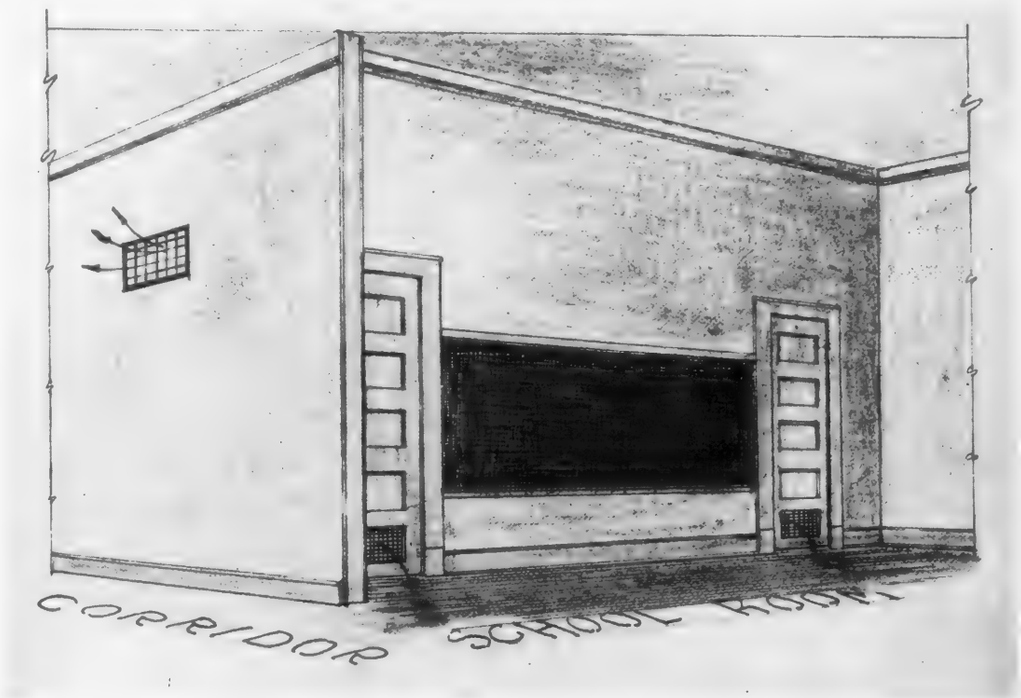
"In my opinion, it is perfectly good engineering and a safe procedure to have schoolrooms vented through corridors and stairways to the top floor where a ceiling outlet would permit of escape through a ventilator on the roof. Modern school buildings should be fireproof. There is in my opinion no more danger of having a general vent distributed over the main halls and corridors than in having individual vents in the rooms."

"It is my opinion that no exception could be taken if the air is allowed to escape from schoolrooms into corridors, then up the stairways, and out through ventilators on the roof, if the draft is outward and is continuous and positive throughout the entire time the rooms are occupied. The air escaping from a well-ventilated schoolroom is no different than the condition of the air within the room. Therefore, what ill effect could it have in the corridors?"

"To allow air to escape into the corridors will prove to be a measure of economy in the cost of the building itself, the cost of heating the building, because it completely obviates any down drafts and also permits of easy recirculation in the early morning hours when the building is being heated up before the occupants arrive. There has been such an unwarranted prejudice against this practice that we always have hesitated to recommend it, but at the same time it is our opinion that there is nothing wrong with it and there are many things in its favor."

"I believe that inside of ten years this system will be universally accepted as the logical and economical way of ventilating school buildings."

While other similar opinions could be quoted, it is not *opinion* but *performance* that is going to win further recognition for corridor venting. Engineers who are open-minded, recognize this and a great many of them are watching with interest the buildings now equipped in this manner. If in their estimation, the objections have been overcome and there are other advantages to be gained, this form of venting schoolrooms will soon become general throughout the various states.



Grilles in Lower Panel of Coat Room Door. Outlet Grille Corridor Partition 8 Ft. Above Floor

Pile of Typical Run-of-Oven Product from the K.S.G. Process

A Brand New Domestic Fuel

Oil and Gas Have Occupied the Limelight as House-Heating Fuels for Some Years. Coke Made by a New Process Described in This Article Has Characteristics Which Will Make It a Serious Competitor of the Fuels Now Being Marketed

By Clifford Strock

Assistant Editor, The Heating and Ventilating Magazine

FOR some years engineers have been increasingly interested in observing the development of low-temperature carbonization processes on which millions of dollars have been spent in this country and abroad. Briefly, low-temperature carbonization is a method of manufacturing coke by the use of lower temperatures than are employed in by-product coke plants. The construction, in New Jersey, of the largest plant in the world employing this process, has drawn the attention of heating engineers to the possibilities of the new fuel.

No less an authority than George A. Orrok, a consulting engineer of New York, has stated that "the market for a low-temperature coke is ready and waiting, but its characteristics must be right. It must be strong, readily ignitible, but not too free-burning, low in ash and free from tars, and, above all, its price must be competitive."

Nearly two years ago work was started on a plant in New Brunswick, N. J., designed to employ the K.S.G. process of manufacturing low-temperature coke. This plant was recently placed in operation by the New Jersey Coal and Tar Company, a subsidiary of the International Coal Carbonization Company, which, in turn, is a subsidiary of the International Combustion Engineering Corporation. The latter company controls the K.S.G. process, the initials of which are those of the Kohlenscheidungs-Gesellschaft, meaning, literally, Coal Separation Company. From this process are made a smokeless, free-burning, domestic coke, a gas of high calorific value, and a large yield of tar.

Heating engineers are concerned more with the yield than with the construction of the plant. Tests have been made on a large scale, and the following yields may be expected from 2000 lbs. of a typical high-volatile American coal:

	Quantity	Per cent by Weight
Semi-coke, 12% volatile	1474 lbs.	73.7
Tar	25 gal.	11.0
Gas, 800 B.T.U. per cu. ft.	3500 cu. ft.	9.3
Light oil	3 gal.	1.0
Water		5.0

The volatile of the coke runs from 10% to 15% and averages about 12%. One of the advantages

of the coke is that a large fire is not necessary to maintain combustion. The fine coke is used as producer fuel to heat the retorts and in the steam plant which supplies the motive power for the machinery. Of the approximately 1500 lbs. of coke resulting from the carbonization of 2000 lbs. of coal, 1200 lbs. is of saleable size. This burns with a short blue flame and is sold under the trade name of Disco, coined from the words distilled coal.

The name "by-product coke" cannot be applied to the resultant fuel. While coke is a by-product from the plants maintained by gas companies, the principal product is gas. In this process, however, with 74% of the resulting products consisting of coke, it easily is understood that coke is the most important part of the yield, and consequently it must be sold at a profitable price. Perhaps the determining factor in locating the first plant in New Brunswick was the concentration of potential customers in this territory.

A contract with the Public Service Electric and Gas Company of New Jersey calls for the delivery from the new plant of a minimum of 3,000,000 cu. ft. of gas per day with a fuel value of 535 B.T.U. per cu. ft. The retorts are heated by producer gas, so that the total yield of gas is available for outside consumption. Inasmuch as it has a heating value of 800 B.T.U. per cu. ft., the gas is mixed with 300 B.T.U. blue gas made from bituminous coal in an adjacent plant. Although the yield consists of 3500 cu. ft. per 2000 lbs. of coal, the total amount of gas with the lower fuel value amounts to about 8000 cu. ft. per ton of coal carbonized.

The coal used is a slack size of a coking bituminous class, distillation taking place as the coal is moved through a rotating, externally-heated, cylindrical retort. Each of the eight retorts used in the New Brunswick plant has a capacity of from 80 to 100 tons of coal per day.

The retorts consist of two concentric drums, inclined slightly from the horizontal, and mounted in a furnace setting, as shown. The outer drum is 72 ft. long and has a diameter of 10 ft., while the inner drum is 85 ft. long with a diameter of 5½ ft. Raw coal is fed continuously into the lower end of the retort through a screw conveyor. Helical flanges in the inner drum carry the coal to the upper end, from which it spills into the outer drum. After reaching the lower end of the retort, by which time it has reached a state of semi-coke, it is picked up by scoops, dropped onto a receiving plate and carried by reverse helical flanges to the discharge gate. The time the coal is in the retort amounts to 2 hrs.

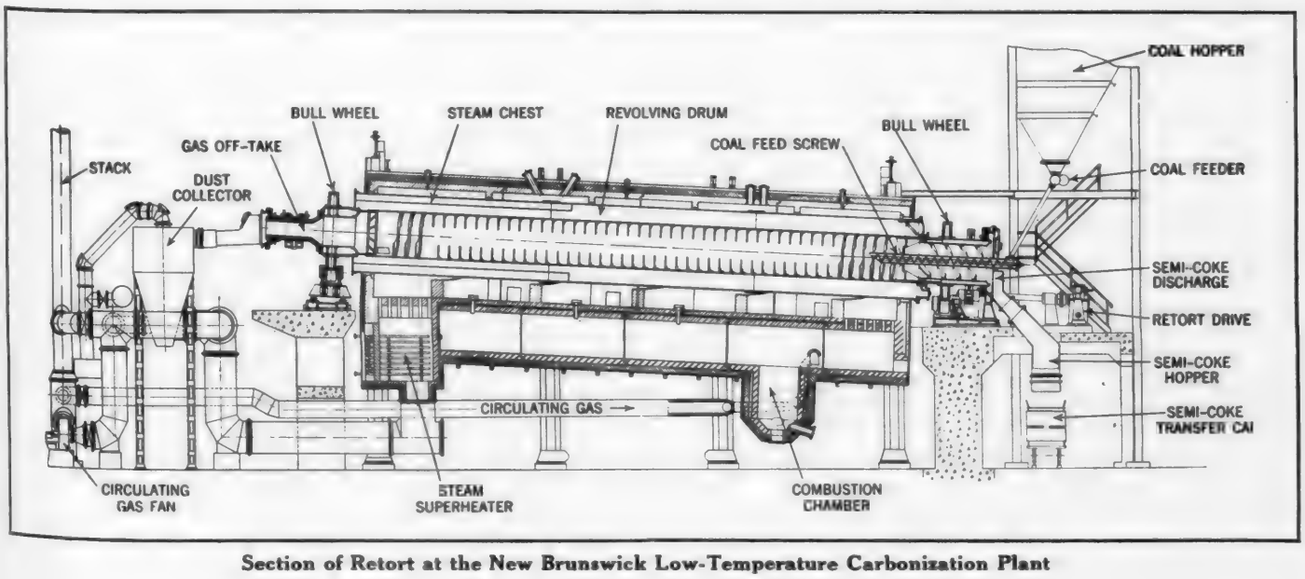
The hot semi-coke is cooled by a dry coke quencher and the inert gases circulated through the quencher are water cooled. The use of this process secures a better coke structure with a smaller percentage of coke breeze and fines than is possible when the coke is wet-quenched. K.S.G. coke has a more porous structure than by-product coke, and if wet quenching were used the coke would absorb a considerable amount of water.

After quenching, the coke is conveyed to the screens on inclined conveyers where it is graded into the usual domestic sizes, ¾ in. being the smallest size sold. Smaller sizes are used for producer fuel, for boiler fuel in the steam plant supplying motive power for the equipment and some is recirculated in the process.

George Orrok's Paper on Low-Temperature Carbonization and the Fuel Problem

Much has been written in the technical press concerning the design and construction of such plants, especially abroad. Little has been written concerning the possibilities of this new fuel in house heating. Consequently, a paper entitled "The Domestic Fuel Problem as Modified by Low-Temperature Carbonization," delivered by George A. Orrok before the American Society of Mechanical Engineers at the recent Knoxville meeting, is particularly timely since it was delivered just prior to the opening of the New Brunswick plant.

Mr. Orrok states that 115,000,000 tons of coal are used for domestic purposes, of which 40,000,000



Section of Retort at the New Brunswick Low-Temperature Carbonization Plant

	COAL		COKE		GAS		OIL
	Bituminous	Anthracite	High Temperature	Low Temperature	Manufactured	Natural	
B.T.U. per lb.	13,500	12,300	13,500	13,500			
B.T.U. per cu. ft.					500	1000	
B.T.U. per gal.							155,000
	Per short ton				Per 1000 cu. ft.		Per gal.
Price	$4	$14	$12	$9	50c	50c	9c
Heating efficiency per cent	60	65	65	65	75	75	75
Cost per million B.T.U. at above efficiency	24.7c	87.5c	68.3c	51.3c	$1.33	66.7c	77.5c

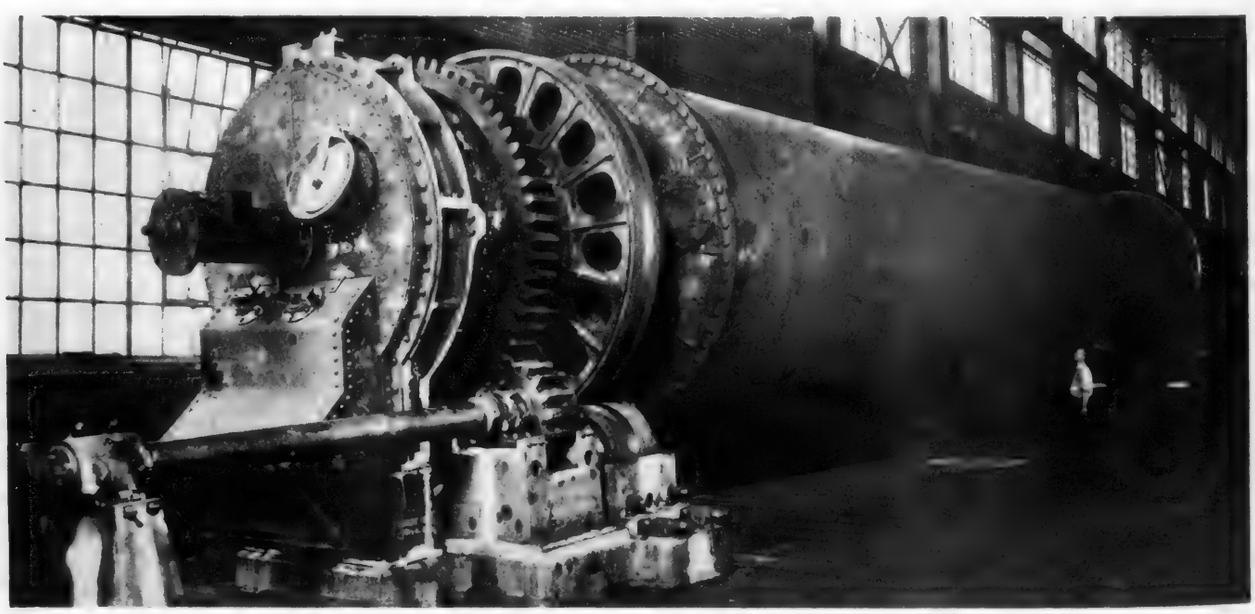
tons are anthracite. In 1927, 8,000,000 tons of by-product coke was used as domestic fuel, and the equivalent of 27,000,000 tons of coal was represented by natural and manufactured gas sold for house-heating purposes. Fuel oil for domestic heating was consumed in quantities equivalent to approximately 2,000,000 tons of coal and many homes, especially in New England and some western states, were heated by wood fires. In the country at large, the domestic fuel problem is solely one of price and convenience.

Tar and Combustibles Given Off by Domestic Chimneys in Large Quantities

The author then goes on to say that experiments have shown that relatively larger amounts of combustibles and tar are given off by domestic chimneys than from industrial stacks, while the latter show more ash or cinders. The reason is that industrial furnaces are run more efficiently, using higher temperatures, better firing methods, and little combustible escapes unburned. In household fires the temperatures are low and the tars escape without burning along with much of the carbohydrates. The remainder of Mr. Orrok's paper is here presented:

Anthracite is practically smokeless and when the larger sizes are used the dust also is much reduced. Coke also is smokeless and dustless to a degree when the coke is hard and has been screened. Gas can be smokeless and dustless, but oil, coke, and tar drops are more common than they should be. All of these fuels are high priced, and the convenient fuels, gas and oil, are perhaps much more costly than the others. It has been proposed to carbonize bituminous coal at a low temperature, thereby securing by-products of such high value that the resulting coke, smokeless and comparatively dustless, can be sold at little, if any, advance over the coal from which it has been made.

Low-temperature carbonization to produce a domestic fuel has been experimented with in a variety of forms, but the main end in view is a reasonably hard fuel about the size of stove anthracite, say 1-in. to 1½-in. lumps. These lumps must contain enough volatile matter (free from tars) to ignite readily, burn with a short flame, should be low in ash, not readily disintegrate, and should be hard enough to avoid dust and fines and serious breakage during transportation. Most of the gas content and all of the tars should have been removed by the low-temperature process.



View of One of the Low-Temperature Carbonization Retorts After Being Assembled

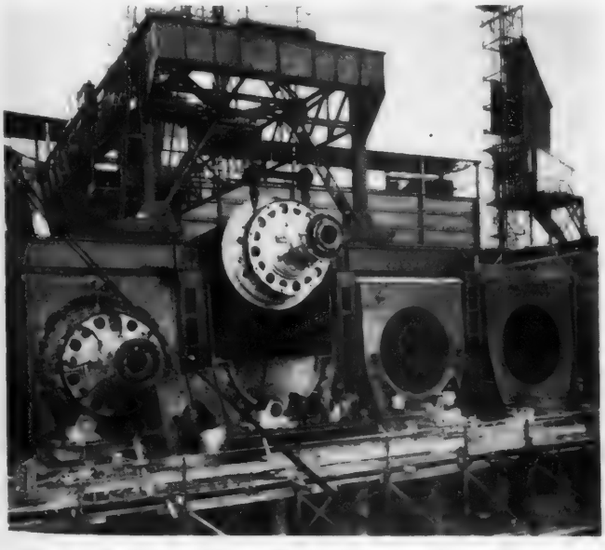
The raw coal may be treated in a vertical oven as in the fuel research process, either with or without briquetting. It may be crushed and agglomerated in lumps in the rotary kiln as in the K.S.G. process. It may be carbonized and briquetted and treated to a second heating, as in the McIntire or Carbocoal process, or it may be agglomerated with oil and then carbonized as in the Trent process. Only a few of the many low-temperature processes are designed to produce fuel suited to the requirements outlined above, as in most of the processes a char or semi-coke is made which is so soft and friable in its nature as to be very dusty and much too free burning. These processes do not produce a reasonable domestic fuel and in most cases have been designed with other ends in view.

The reason for the popularity of natural gas even at higher prices than 50c per 1000 cu. ft. is plain, and wherever this form of fuel is available at a reasonable price it supersedes all others. City gas is attractive, oil is largely used, but anthracite has held the field among solid fuels. It is only lately that coke has become a serious competitor. Bituminous coal is used only where no other fuel is available at a competitive price.

Production of Low-Temperature Coke Will Aid Solution of Domestic Fuel Problem

Thus it will be seen that the market for a low-temperature coke is ready and waiting, but the characteristics must be right. The coke must be strong, readily ignitible, not too free burning, low in ash, free from tars, and, above all, its price must be competitive. Small quantities of coke of this type have been marketed at a distance from the ovens. For instance, Carbocoal has been sold in competition with anthracite in the Cincinnati district. Even in England, where many experimental plants are in existence, no plant has as yet paid dividends as a going concern. However, a number of low temperature processes have made a good domestic fuel, filling all requirements, and it now remains for the owners of those processes to show that their product can be made continuously, and at a price which will ensure the sale of the product and the commercial soundness of the venture.

The markets are here. Smokeless and reasonably dustless fuels already command high prices, and such installations will greatly aid in the solution of our domestic fuel problem.



One of the Eight Retorts Being Lowered into Place at the K.S.G. Plant, New Brunswick

Aerial View of the New Brunswick Plant of the New Jersey Coal and Tar Company

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Central Heating Plant for Oslo

THAT plans for inaugurating a central heating plant for Oslo, Norway, have been drawn up by Karl Ingero, director of the Polytechnical Association, and are now under consideration by the city authorities is the information contained in a recent issue of the *Christian Science Monitor*. The central heating plant, according to the plans, will be located on a large lot near the quay for great sea-going steamers. From this station that part of the town which is within the radius of two kilometers may be supplied with central heat and hot water for domestic purposes by 1930.

The fuel is to be small-sized, cheap coal. In the first year the central and part of the west end of the town will be supplied with heat. It is hoped that in from four to six years the plant will be able to supply the greater part of the town. Plans include arrangements for the use of several secondary stations so that too high pressure need not be carried in the mains.

Limitations of Direct-Connected Fans Operating at Fixed Speeds

By Charles A. Carpenter

Carpenter & Byrne, Pittsburgh, Pa.

IN THE HEATING AND VENTILATING MAGAZINE for March, H. F. Hagen, of the B. F. Sturtevant Company, presented an interesting article on the characteristics of centrifugal fans. However, it appears to the writer that there are more obscure or less known factors that must be considered in order to make a proper fan selection.

During the early part of 1912, the writer published articles in *Power* and *Electrical World* showing the application of "specific speed" to centrifugal pumps and fans. Without republication of all the mathematics involved, which material may be found in a paper presented by Prof. T. G. Estep and the writer before the Engineers' Society of Western Pennsylvania, specific speed K may be defined as:

$$\text{Specific Speed, "K"} = \frac{R\sqrt{Q}}{79.72\, h^{3/4}}$$

R = R.P.M.
Q = C.F.M. delivered
h = water gauge at 70° F. and 29.92 in Hg
$79.72 = \sqrt{6356}$

From an analysis of the quantity-pressure and quantity-efficiency curves obtained by testing a fan of given standard design, it is possible to plot a curve with specific speeds as abscissae and efficiencies as ordinates. There is a limited range of specific speeds for high efficiency for each type of fan. If the R.P.M. may be set to suit any particular fan, then selection may be made from an investigation of characteristic curves, but if a direct-connected drive be required at some fixed speed the problem is greatly complicated. The table shows some values of K for various general types of fan.

It is apparent that a predetermined R.P.M., C.F.M., capacity and required water gauge definitely fix a value of K. The choice of a fan for these conditions involves many considerations.

The peripheral velocity may be too high for a standard backward curve fan. This type of fan would have the largest diameter.

No standard fan may meet the conditions without unnecessary excess capacity.

A special fan of some less desirable character-

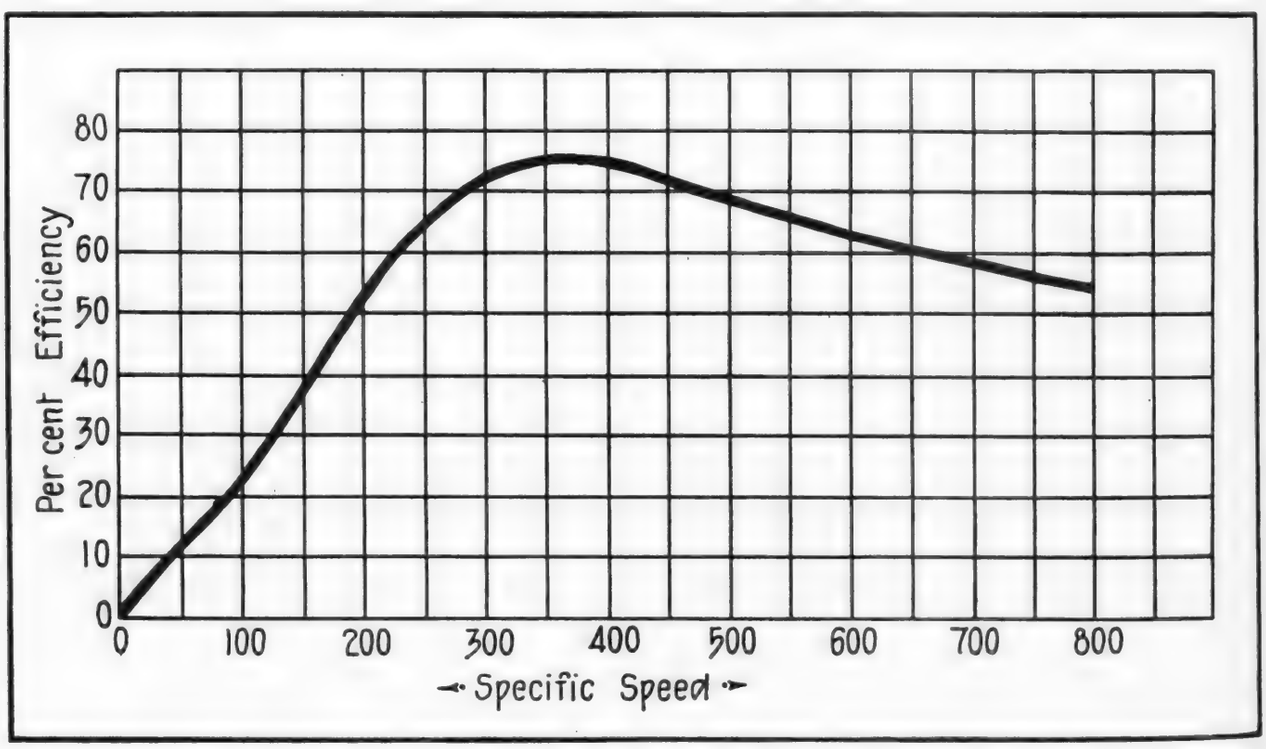
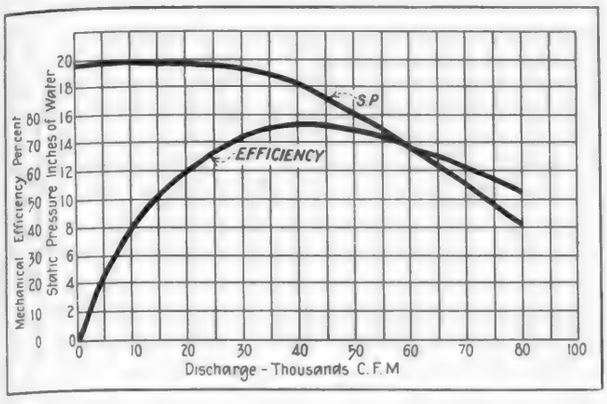


Fig. 1. Efficiencies at Various Specific Speeds, Backward-Curved Blade Fan



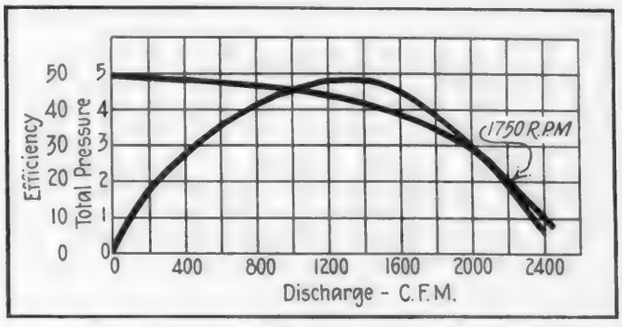


Fig. 4. (Above) Characteristics of Fan with Radial Blades

Fig. 2. (Left) Characteristics of Fan with Backward-Curved Blades

istics possibly may be made more efficient than any other if exact operating conditions can be determined.

It may be highly desirable to convince the user that some different motor speed or some indirect drive should be used.

Reference to the table indicates that the range of specific speeds for all well-known existing types of fan is quite limited in scope even if a very considerable sacrifice in efficiency be made. It also is apparent that there is a relatively small possible variation in peripheral velocity.

It is evident that specific speed is not so greatly affected by changes of width if reference be made to the tables. Obviously specific speed "K" should be kept under 900 for double-inlet fans and 630 for single-inlet fans if good efficiency is desired. For very best results, "K" should lie between 250 and 750 for double-inlet and between 175 and 525 for single-inlet fans.

Lower values of "K" may be obtained by making a fan wheel narrower, but this involves a special fan. Very narrow wheels necessarily are inefficient.

The accompanying curves show the application of the relation between efficiency and specific speed in determining the limitations in the application of any fan design.

Fig. 2 shows the usual head-quantity and efficiency-quantity curves of a fan having backward-curved blades. Fig. 1 presents a curve for the relation between efficiency and specific speed.

Suppose that it is required to build a fan to have a capacity of 75,000 cu. ft. per min. at a constant speed of 1200 R.P.M. and develop a total pressure of 10 in. of water.

Substituting the above values in the equation for specific speed, and solving, a value of 735 is obtained. Referring to the curve in Fig. 1 it is seen that this specific speed gives an efficiency of about 57%. In other words, this design cannot be used under the conditions stated without considerable sacrifice in efficiency.

Suppose, however, that a specific speed of 350 is chosen, which, from the curve, will give the highest efficiency possible. Again substituting in the equation mentioned and solving for the actual speed, a value of 572 R.P.M. is obtained, which is the required speed of a homologous fan to give the best results under the conditions stated.

Figs. 3 and 5 show corresponding curves for a fan having forward-curved blades. It is to be noted that fans of this type have a very much narrower range of specific speed for good efficiency than those having backward-curved blades. The dotted vertical lines on the specific-speed curves show the

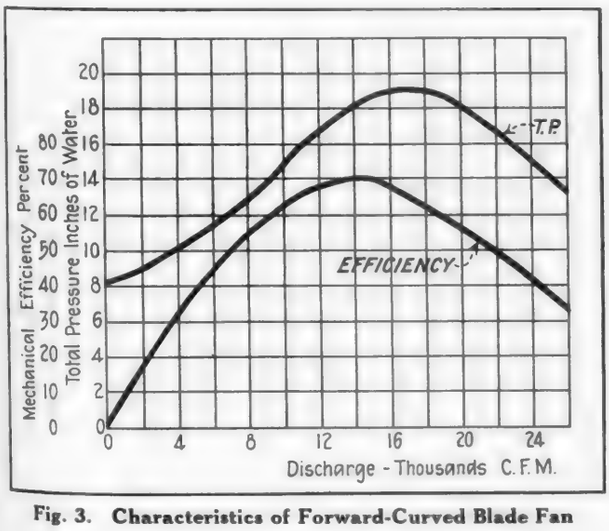


Fig. 3. Characteristics of Forward-Curved Blade Fan

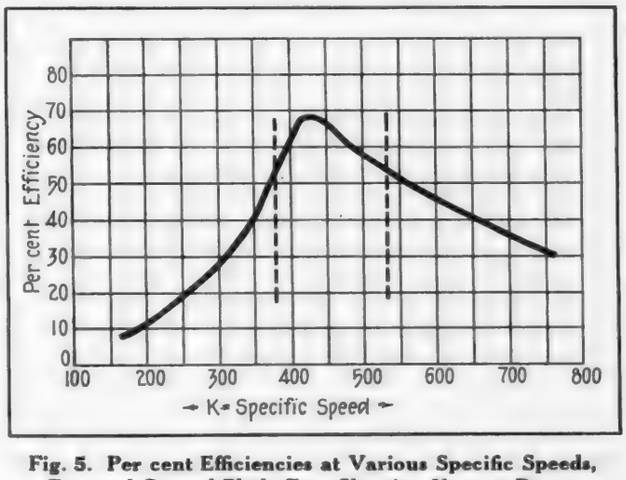


Fig. 5. Per cent Efficiencies at Various Specific Speeds, Forward-Curved Blade Fan, Showing Narrow Range of Operation

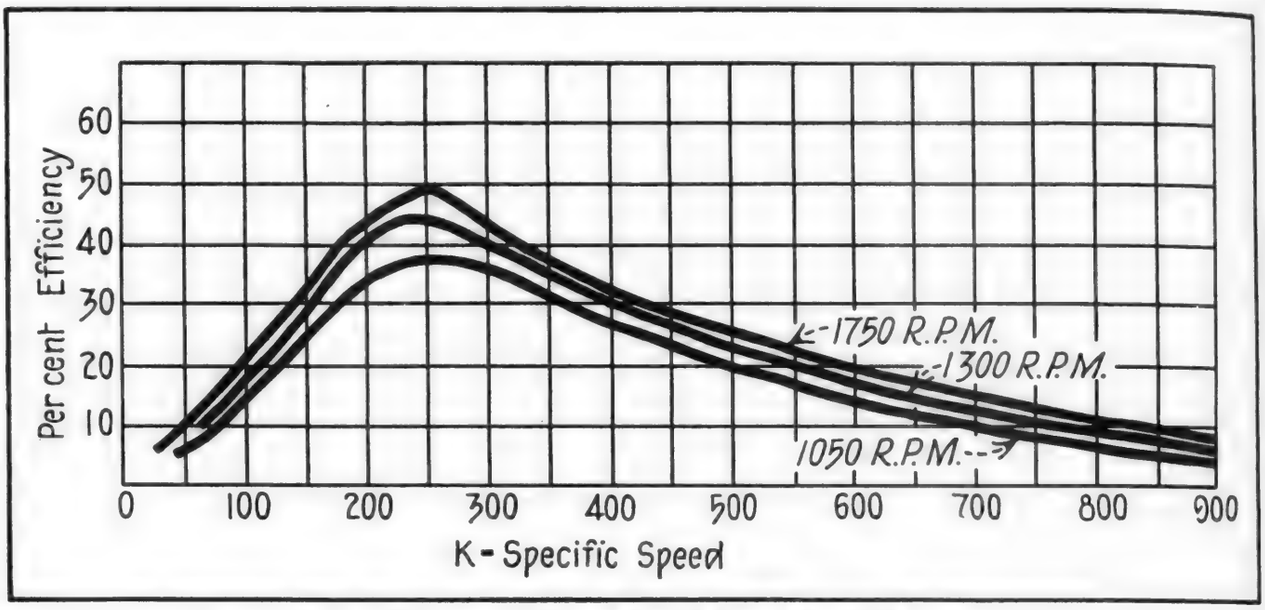


Fig. 6. Efficiencies at Various Specific Speeds, Radial Blade Fan

limits within which the manufacturer offers this design of fan.

Figs. 4 and 6 are interesting because they show clearly the soundness of the theory of specific speed and its application. These curves are plotted from carefully made tests on a variable-speed, radial-bladed, steel-plate fan. For the purpose of the chart, only three speeds have been plotted, but they show clearly that no matter what rotative speed is used, the best efficiency will obtain at a fixed specific speed.

It should also be noted from this chart that not all fans of homologous design will have the same maximum efficiency, but that the best efficiency under given conditions of speed, capacity, and head will be obtained with a fixed specific speed.

The above comments have been based largely on the possibility of obtaining a fan of special dimensions that will most nearly meet the required specific speed. Since it is the desire of most manufacturers to adhere to certain definite sizes, it is well to study the effect of deviation in diameter from the theoretically fixed size. The writer prepared for publication in the *Ceramic Products Cyclopedia* a study of several sizes of similar fans operated at fixed speed and the following description is reprinted from that publication.

The six main curves in Fig. 7 show the relation between capacity in cubic feet of air per minute and in static pressure in inches of water gauge for fans of exactly similar design operating at constant speed. The radial lines show static efficiency.

DOUBLE-INLET FANS—BASED ON TOTAL PRESSURE
TYPES OF WHEEL BLADING

	Forward-Curve Sharp Angle Approximately 45°	Forward-Curve Moderate Angle	Forward-Curve Radial Tip	Steel-Plate Radial Flow	Backward-Curve Slight Angle	Backward-Curve Moderate Angle	Backward-Curve Approximately 60° Angle
Maximum desirable ratio of wheel width to wheel diameter	1.00	0.80	0.80	0.60	0.20	0.80	0.85
Specific speed at point of high efficiency	500-600	550-650	550-650	300-400	400-550	450-600	675-775
Mechanical efficiency	53-67	55-70	63-72	52-65	65-72	68-76	65-75
Specific speed when mechanical efficiency is approximately 40% (applying to overspeeded fans)	750-850	850-950	.....	550-650	1300-1600	1500-1800	1500-1800
Ratio of tip speed to theoretical speed of the air at the pressure produced at point of high efficiency	0.64-0.76	0.75-0.85	0.78-0.88	0.90-1.00	0.90-1.00	0.95-1.05	1.10-1.30
Ratio of tip speed to theoretical speed of the air at the pressure produced at point of 40% efficiency	0.77-0.92	1.00-1.10	.....	1.14-1.30	1.3-1.6	1.6-1.75	1.65-2.1

DOUBLE-INLET FANS—BASED ON STATIC PRESSURE

Specific speed at point of high efficiency	450-700	600-700	650-700	275-375	450-600	450-600	650-850
Static efficiency	50-60	50-60	55-65	47-63	60-70	65-74	63-73
Specific speed when static efficiency is approximately 40% (applying to overspeeded fans)	800-1000	900-1100	.....	475-575	1200-1400	1300-1500	1500-1700
Ratio of tip speed to theoretical speed of the air at the pressure produced at point of high static efficiency	0.68-0.85	0.85-0.95	0.87-0.97	0.92-1.05	0.92-1.05	0.96-1.06	1.15-1.35
Ratio of tip speed to theoretical speed of the air at the pressure produced at point of 40% static efficiency	0.80-0.95	1.00-1.15	.....	1.12-1.32	1.30-1.50	1.5-1.7	1.65-2.15

SINGLE-INLET FANS—BASED ON TOTAL PRESSURE

	Forward-Curve Sharp Angle Approximately 45°	Forward-Curve Moderate Angle	Forward-Curve Radial Tip	Steel-Plate Radial Flow	Backward-Curve Slight Angle	Backward-Curve Moderate Angle	Backward-Curve Approximately 60° Angle
Maximum desirable ratio of wheel width to wheel diameter	0.50	0.40	0.40	0.30	0.40	0.40	0.425
Specific speed at point of high efficiency	350-425	390-460	390-460	210-285	280-390	320-425	480-550
Mechanical efficiency	53-67	55-70	63-72	52-65	65-72	68-76	65-75
Specific speed when mechanical efficiency is approximately 40% (applying to overspeeded fans)	530-600	600-675	.....	390-460	920-1130	1060-1270	1060-1270
Ratio of tip speed to theoretical speed of the air at the pressure produced at point of high efficiency	0.64-0.76	0.75-0.85	0.78-0.88	0.90-1.00	0.90-1.00	0.95-1.05	1.10-1.30
Ratio of tip speed to theoretical speed of the air at the pressure produced at point of 40% efficiency	0.77-0.92	1.00-1.10	.....	1.14-1.30	1.3-1.6	1.6-1.75	1.65-2.1

SINGLE-INLET FANS—BASED ON STATIC PRESSURE

Specific speed at point of high efficiency	320-500	425-500	460-500	190-270	320-425	320-425	460-600
Static efficiency	50-60	50-60	55-65	47-63	60-70	65-74	63-73
Specific speed when static efficiency is approximately 40% (applying to overspeeded fans)	560-710	630-780	.....	330-410	850-1000	920-1060	1060-1200
Ratio of tip speed to theoretical speed of the air at the pressure produced at point of high static efficiency	0.68-0.85	0.85-0.95	0.87-0.97	0.92-1.05	0.92-1.05	0.96-1.06	1.15-1.35
Ratio of tip speed to theoretical speed of the air at the pressure produced at point of 40% static efficiency	0.80-0.95	1.00-1.15	.....	1.12-1.32	1.30-1.50	1.5-1.7	1.65-2.15

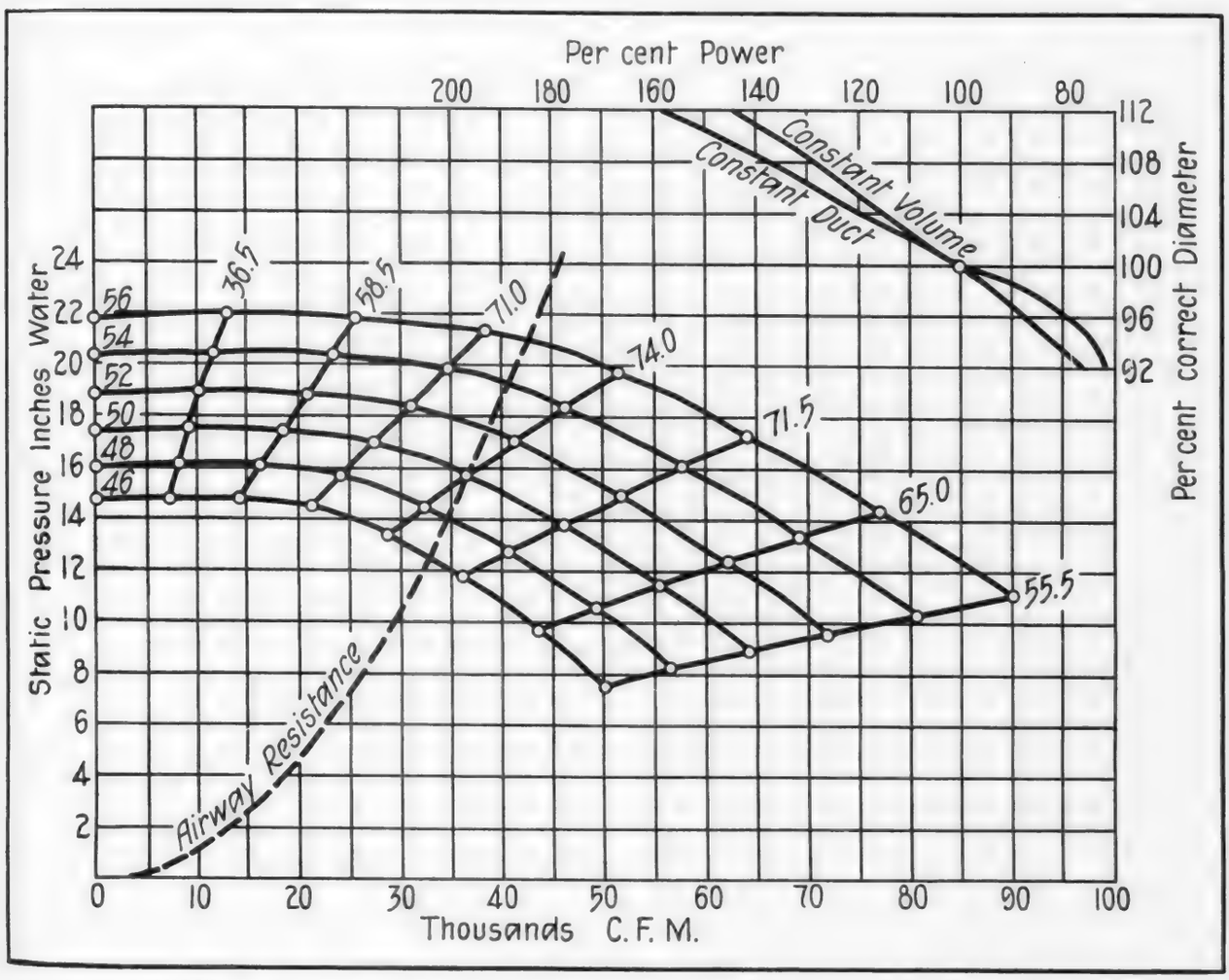


Fig. 7. Graph Used to Determine Effect of Wrong Diameter at Constant R.P.M.

Assuming that the 50-in. fan is the most suitable for the air way resistance as shown when this fan is operating at a fixed speed, and it is possible to obtain 74% static efficiency, then the lines will intersect the airway resistance curve at the point shown.

If this intersection represents 100% of the desired capacity and pressure, and the required brake horsepower be figured, then the capacity, pressure, and brake horsepower of the other sizes of similar fans can be calculated from the intersection of the air way resistance curve with the volume lines and pressure curve of each fan.

Computing the percentage each brake horsepower figures compared to the 50-in. fan which we have assumed as 100% correct, the constant duct curve shown in the right-hand corner can then be plotted. If larger fans are applied to produce these conditions, they naturally will produce a greater pressure and more volume at this constant speed, and must be dampered back, thus developing needlessly higher pressures at a loss in efficiency. Smaller fans, on the other hand, will produce lower pressures at a sacrifice in efficiency.

The percentage comparisons for constant volumes are shown in the upper right-hand corner. Should the fan wheel vary 12% in diameter when operating at a fixed speed, and the duct is dampered to produce constant volumes, there would be approximately 44% additional power used for this operation. Should the duct not be dampered but kept constant, and the diameter of the fan wheel be 12% greater at the fixed speed, there will be approximately 59% additional power used.

It readily can be demonstrated mathematically that the waste in power due to having a fan wheel too large in diameter if operated at constant speed increases very rapidly as the error increases. This is particularly true of paddle wheel, radial flow and backward-curve fans and of forward-curve fans if operating over that portion of their characteristic curve where the pressure increases as the volume is reduced. In fact, within the scope of the above comments, the power will vary between the cube and fifth power of the ratio of incorrect to correct diameter.

It is evident from a consideration of specific speed and the effect of excess diameter that the buyer of a direct-connected fan must be sure that the advantages of direct connection at this desired speed offset the probable increase in power consumption, the possible necessity of selecting a fan of undesirable operating characteristics and the possibility that he may impose requirements, necessitating unnecessarily high rim speeds.

The writer would urge, for the consideration of fan manufacturers and fan users, the more general use of the material offered in the tables appearing on pages 62 and 63, so that each manufacturer could show to the trade the desirable operating specific speeds for their various fans, the maximum desirable width of wheel in percent of wheel diameter and relative or actual rim speeds. Without a consideration of these various factors, the fan buyer is compelled to purchase more or less in the dark.

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Experimental House Built in Great Britain to Measure Heat Comfort

By A. C. Blackall

THE Building Research Board at Watford, a few miles outside London, recently has erected an experimental house with the idea of producing the greatest amount of heat comfort on the most thoroughgoing scientific lines. It was well tested during the great frost in mid-February, of which one of the experimenters said: "It's just what we want! It gives us extremes."

In size the experimental house corresponds to one of the ordinary subsidy houses which now abound everywhere in England. It is built in a steel frame in such a way that the walls and the roof can be replaced by walls and roof of other materials. At present the house has 9-in brick walls and a tile roof. In the next stage of the experiment it is to have "cavity" walls. In fact, it was intended that the house should have changed its face some time ago, but when experiment had fairly begun it was found that the problems of heating were so complicated that the duration of the first—the brick—stage of the experiment had to be continued indefinitely.

Electricity is used exclusively for heating the house for reasons which will be clear hereafter. In each room there is an electric stove and near the middle of the room a dummy man. This is an interesting person. He is a black-painted hollow copper cylinder, inside of which is an electric heater which dissipates 20 watts. ("That" said the informant, "represents his breakfast.") Now it is required to keep this dummy man "comfortable," and for the purpose of this experiment his comfort has been postulated as a temperature of 75° F., and he is to lose heat at the rate of 17.5 B.T.U. per sq. ft. per hr. This is held to be a condition of comfort for a sedentary occupation. The dummy is sensitive to surrounding objects, to drafts and to sunshine, and whenever his temperature rises to above 75° he automatically switches off the stove.

In some of the rooms where there is little draft and little sunshine the dummies seem to lead fairly regular lives and the chart shows that they switch the heat on and off at regular intervals. In other rooms the graph is more erratic. It is surprising what a difference winter sunshine makes in the temperature of a room. When in the direct sun the dummy naturally is comfortable with a much lower air temperature, but it has been found that sun-

Experimental House Used by Building Research Board at Watford, near London

light radiated from the walls makes a very great difference too. The dummy makes great play with his switch in the sunnier rooms.

Some of the odd effects of radiation have been brought out in the tests. It was found, for instance, that sometimes at night a wall will be radiating heat into the room, instead of out of it, even though the temperature of the room is considerably higher than that of the air outside. The explanation is that one of the walls on which the sun has been shining during the day is warmer than the opposite wall and the inward radiation from this wall to the cooler wall is greater than the normal radiation from the center of the room outwards. Some building materials delay the passage of the sun's heat by 8 or 9 hrs., and it is suggested that it may be possible to build houses in the tropics in such a manner that one room will not let the heat through till night, when it is more bearable, and another room will be adapted for use during the day.

In the experimental house delicate instruments record the heat radiation and convection of each wall. Radiation from windows presents a still more complicated problem which is receiving special attention. At the present stage of the experiment the ventilation factors are kept as simple as possible. The windows are never opened.

It is proposed later to heat the house with coal and coke fires and there will be many variations in the experiment.

Dr. Margaret Fishenden, who has been making researches into fuel, is cooperating with A. S. Dufton, at the experimental house. Their special report on "Heat Transmission" is to be published by H. M. Stationery Office immediately. It is hoped later to make researches into low-temperature radiant heat, which involves innumerable problems—physiological, as well as engineering. Where, for example, in a room warmed by radiant heat is the radiating panel to be placed? In the center of the room? On the floor? In the ceiling? If it is put in the ceiling the office worker will complain because his feet are cold, being under a desk and in the shade. If it is put elsewhere there will be other objections.

Many homely questions, in the end, may receive scientific answers. It may be possible to discover exactly what is the economy in heating made by building houses in rows like barracks. In a block of flats which is the warmest, the ground floor, the first or the second?

Already strong scientific support is being given to the common sense of our ancestors, who covered their walls with wood panelling. It has been found that with double the rate of heating which serves to maintain warmth, the time taken to warm the surface of a 9-in. brick wall is six hours; for a 1-in. wall of wood the time is 10 min.

Interior of Experimental House, Showing the "Dummy," a Black Painted Copper Cylinder

How One Heating Contractor Looks on Oil Burning

Problem Involves More Efficient Use of Oil Flame and Better Adaptation of Oil-Burning Heater to Type of System Installed

By David B. Hayes

AS I see it, the oil-burner problem revolves around the question as to whether the oil-burner manufacturers, boiler makers, heating and piping contractors, and builders of automatic control devices will cooperate in working out a proper equipment for the use of oil as a fuel.

Even the opponents of oil fuel will admit it to be an ideal method for heating homes in a climate subject to radical changes in outside temperature, provided proper equipment is made for its use. On account of its ability to meet sudden changes in loads, and its labor- and space-saving possibilities, which are universally acknowledged, more industrial plants will install oil burners when they, too, are satisfied that manufacturers are working to put efficient apparatus on the market.

I believe we must all agree that the present oil-heating systems do not admit of the most efficient and economical use of oil as a fuel. Until it unquestionably is demonstrable that oil heaters are more practical economically than those burning solid fuels, we must feel that our oil-heating equipment must be improved, and eventually, I believe, radically changed.

How radical must these changes be to meet the requirements for its successful and economical use in competition with solid fuels?

Perhaps some experiments and observations that I have made recently might suggest the direction which some of these necessary changes may take to bring about better results.

What Type System Operates Best with Oil

The tests I have made have convinced me that we must forget many of the old methods that have been used. We must look forward to the time when there will be no further attempts to adapt old apparatus to new fuels, but rather must we devise new contrivances which shall utilize to the fullest the specifically oil-fuel possibilities. In addition, consideration must be given to the kind of system best suited to oil-burning heaters. This last problem is one of much importance and we shall now examine it more closely.

The system must be one which will respond quickly to the action of the burner. Which of our various heating systems meets this fundamental requirement most satisfactorily?

Will the slow, sluggish, hot-water plant meet it? Is it not too unresponsive to the quick, sharp heat of the burner? Is it not too slow in cooling off during mild weather? Under automatic control is not the range from low to high too great, unless, through some device, the water is not allowed to go below a predetermined temperature which would not be hot enough to circulate heat unless heat is required?

Again,—does not the warm-air furnace and the indirect heating plant have to be dismissed, with their constant flow of outside air through the system, unless, of course, a means is provided for recirculation?

Will the ordinary steam system, which is constantly expelling and taking in air,—heating it up, and rapidly cooling it off,—meet the requirements? The answer is evident.

It appears to me that we must turn our attention to the vapor-vacuum system, with its quick response to the sharp heat of the oil-burner, and its power to retain heat under vacuum conditions, if intermittent burners are to be used. This conclusion was forced on me after various tests and countless observations of the various systems. These tests brought out many other weaknesses in our present methods of installing oil-heating plants, and I shall submit the results of some of those tests made under actual operating conditions.

Test of Sectional Boiler

On what was originally designed as a hot-water plant, and had been operating as such for three years, the following observations were made.

In cold weather the particular plant under discussion could not heat the building. The writer was called upon to check up the installation of the plant. A survey showed the boiler to be large enough, but that it only radiated about 10% in excess of a steam system. As this was a water-tube, sectional, header-type boiler, it was suitable for either water or steam.

I suggested, instead of changing all the radiators and piping, that the piping alone be changed and the whole converted into a vapor-vacuum system. This was done, and when the work was completed, a pot-type oil burner was installed. The plant was then put in operation. It resulted in the produc-

tion of plenty of heat, and some surplus boiler capacity.

A short time later I was called upon to install an auxiliary heater to the same boiler for "domestic hot water." While drilling the boiler for a circulator below the water-line, in order to have all sections connected to the auxiliary heater, I decided to put thermometers in each section in order to find out how the burner was reacting on each individually.

I took ten ordinary hot-water boiler thermometers and placed them on a cake of ice. Each checked with the other on the low reading. I then placed them in a pail of hot water. Again they all checked accurately. Of course, I do not know whether they were correct as far as a standard thermometer is concerned, but I do know that they checked with each other. This was sufficient for the purposes of my test.

Thermometers Connected to Each Section of Boiler Equipped with Oil Burner

I inserted one of the thermometers in each section of the boiler, then refilled the boiler which had been drawn part-way down to allow for drilling and tapping of the sections. The fire pot of the burner was placed under sections Nos. 4, 5, 6 of the boiler, which was a 24-in., 10-section type.

When the burner was started, the boiler registered 105° F. in all sections. A compound gauge was being used, the pressure registering in ounces. The needle stood at zero. The burner was allowed to run until the gauge registered 4 oz. of pressure. A record of the readings of the thermometers disclosed the following:

	Deg. F.
Section No. 5 (directly over the burner)	222
Section No. 4 (partly over the burner)	220
Section No. 6 (partly over the burner)	220
Section No. 3 (toward front of boiler)	216
Section No. 2 (further front)	210
Section No. 1 (front section)	198
Note:—Section 1 was uncovered.	
Section No. 7 (toward rear)	218
Section No. 8 (further rear)	215
Section No. 9 (next to last section)	211
Section No. 10 (rear section)	205

It is to be noted that the readings to the rear from burner do not show great variation from one to the other, as do the readings toward the front.

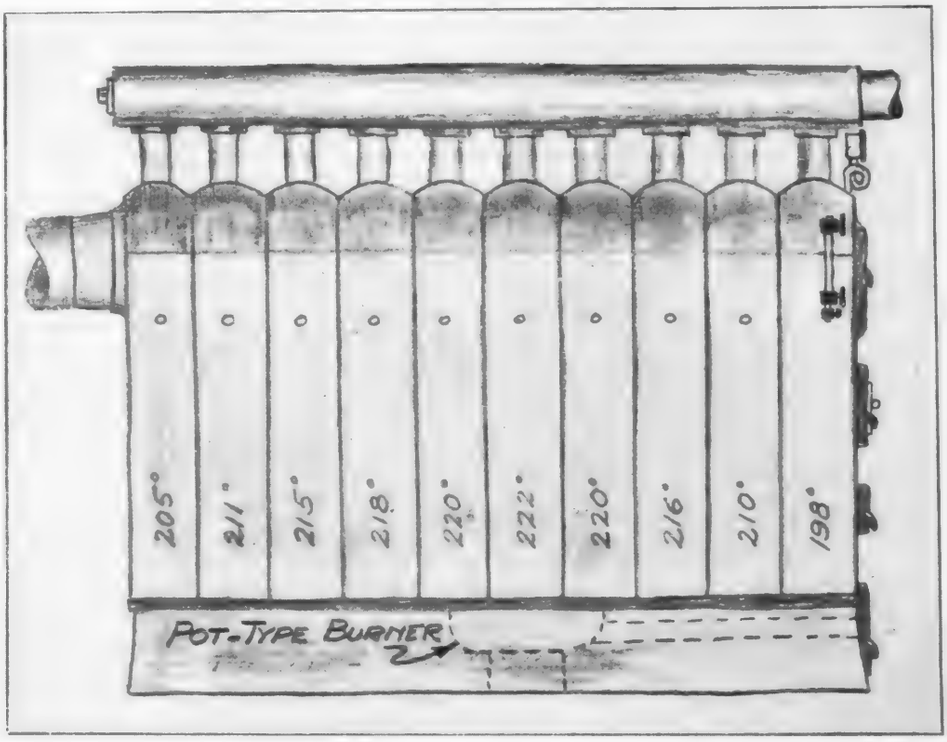
It can be seen that directly over the burner there was developing approximately 3 lbs. pressure, while on either side of the burner the pressure approximated about 2 lbs. Section No. 2 was just about at the boiling point, while Section No. 1, its next neighbor, was 14° below the boiling point. Yet the gauge showed 4 oz. of pressure. (Or was that pressure reading coming down through the header?)

The higher readings to the rear of the boiler, no doubt, were due to the radiant heat or gases flowing toward the openings.

An analysis shows that approximately six sections of the boiler were affected. The two sections on each end were actually cutting down efficiency.

The burner was now shut down, and the thermometers and bushings removed and the circulator installed. As it was necessary for us to finish our work on this boiler, no more time could be spared for further experiment. It is quite possible that if we had allowed the burner to run long enough, the sections would have more nearly balanced themselves in temperature. However, it seems quite

(*Continued on Page* 72)



Sketch Showing Temperatures Indicated in Each Section of Boiler Tested by Author

Gas Heat in Indiana

Details of the Sales and Servicing Policy of One Middle Western Company. Engineering Survey of Each Prospective Installation Aids in Reducing Complaints

By Waldo W. Schram

House-Heating Engineer, Northern Indiana Public Service Co., Hammond, Ind.

NATURAL gas, where available, has widely been used for space heating for years, but it is only in the last few years that artificial gas has received any degree of general acceptance for heating buildings. Probably one of the main reasons why the general public has been slow to adopt gas for heating purposes is that 50% of the gas consumers use approximately an average of only 2500 cu. ft. per month and pay for this service from $30 to $35 per year.

One readily can understand how it would be impossible for an individual, who for years has felt that a monthly gas bill of $3 was exorbitant, to conceive of heating an entire building with gas. His first thought on the subject is that even if such a thing were possible one surely would have to be a millionaire to afford it.

Those of us engaged in the industry know that not only is gas heating possible, but its cost is commensurate with the class of heating service rendered. Gas companies, in order to attract this class of business, have made special rates, and the increased load secured will make further rate reductions possible. Consequently, we may reasonably expect to see a decrease in the gap between the cost of gas heating and heating with other fuels.

If the general use of gas for house-heating is to become popular the public must become acquainted with its desirability and advantages over other fuels. A great amount of educational publicity is necessary, but advertising alone will not sell gas house-heating. Personal solicitation of salesmen is vital. It is evident that it falls to the lot of the gas industry to do this pioneer work—no individual heating contractor could afford it.

While many of the gas-heating installations sold are installed in new buildings, there are equally as many being sold to replace solid-fuel-burning equipment.

When the gas-heating salesman has succeeded in selling a home-owner the idea of doing away with his present heating equipment, and substituting in its stead a gas heating installation, he has created business for the heating contractor, giving him work and consequent profits which he would not otherwise enjoy.

Heating contractors should recognize the gas-heating field as a new opportunity for the expansion of their business. They will find the gas industry ready and willing to cooperate to the mutual advantage of both. They also will find that the gas-heating branch of their business will become the most desirable of all, for after the installation is completed the gas company assumes the service obligation, leaving the contractor's profit intact. Too, the sale of gas heating will be invaluable in building customer goodwill.

When a contractor installs in a man's home a heating plant that eliminates all labor in connection with operating the heating system, makes possible automatic temperature regulation, eliminates all heating plant dirt, and enables the home-owner to enjoy perfect heating service for weeks at a time without even a glance at the plant, he has made a friend who will come back when in need of other services.

The home-owner will not buy a gas-heating installation unless he knows how much it is going to cost him to run it after he has it installed. Due to years of careful study and experiment by the gas

industry it is possible to determine accurately the cost of heating a given building with gas. The first step in determining the cost is making the survey.

A simple form which helps in making the survey complete is shown in Fig. 2. The survey must not only reveal the dimensions of the building, type of construction, number and size of doors and windows, etc., but it must indicate something of the heating installation as well.

I like to think of a heating plant as consisting of three parts—the heat generator, the distribution system, and the heat dissipating or diffusion units. If any one part of the plant is faulty the performance of the whole is impaired. It is obvious that if the heat generator, boiler or furnace, is too small, difficulty will result. The same holds true if flow mains or leader pipes are not properly designed, or if radiators or registers are inadequate for the needs. A gas boiler or furnace should never be installed on an existing system unless the heating engineer in charge has assured himself that each part of the heating plant is large enough for the job and in good repair.

It is obvious that no matter how large the boiler may be, it will be impossible to heat the house under extreme cold weather conditions unless the flow mains and returns are adequate, and there is sufficient radiation to dissipate the heat rapidly. It is likewise obvious that furnace size will mean little if the heat generated cannot be absorbed by sufficient air circulation. It is not sufficient or wise to depend upon statements of the home-owner relative to heating service.

I have experienced cases where owners of homes with inadequate heating systems have insisted that their homes heated perfectly. One marvels how it can be true. The explanation may lie in the fact that the individual has become accustomed to a very poor heating service, and has taken it as a matter of course and thought very little of it. When the gas installation is made, the home-owner will assume a different attitude. He has paid a large sum of money for the installation, and he expects to pay more than he has ever paid before for fuel. Consequently, he watches the heating plant closely and if conditions are not all that they were represented to be during the selling of the job, he has a justifiable complaint. It is probably also true that because coal is a comparatively cheap fuel inefficiencies in heating systems burning such fuel are not as readily apparent as when more expensive fuels are used.

Importance of Checking the Existing Installation

In this day of speculative home building when competition is keen and every item of building cost must be reduced to a minimum, there may be a strong temptation to under-radiate or provide insufficient air circulation. Improperly installed heating plans are sure to cause trouble if a change to gas is made. Therefore, it is essential that a very careful check-up be made to determine if the system has been properly installed. If it is found deficient in radiation, piping, or air circulating ducts, changes which will put it in first-class shape must be made at the time the gas installation is made.

Modern Basement in a Home in Hammond, Indiana, Showing Warm-Air System, Popular in that State

HOUSEHEATING SURVEY

Name_____ Address_____

Wall Construction_____Insulation_____

Windows - Weatherstripped_____Single or Double_____

Loose or Tight_____Wood or Metal_____Casements_____

Floors_____Attic Floored_____Insulated_____

Basement - Pipes Covered_____Ceiling Plastered_____Heated_____

Exposure_____Direction Building Faces_____

Chimney Construction_____

Heat Regulator_____Kind_____Catalogue No._____

Previous Fuel - Kind_____Amount_____Unit Cost_____Total___

Boiler or Furnace - Make_____No._____Size Firepot_____

List Radiators or Leader Pipes and Cold Air Returns

Heating Observations:

General Remarks:

Make Sketch of Floor Plan with Dimensions.

Fig. 2. Survey Form Used by Northern Indiana Public Service Company

The survey will furnish the information necessary to determine the cost of heating. There are many different methods of arriving at this figure. One of the most popular is the determination of the hourly heat loss, and from this base figure arrive at a seasonal operating cost.

From tables published in the handbook "House-Heating," published by the American Gas Association, one can determine the number of cubic feet of gas required per square foot of radiation per degree-day and the number of degree-days normally experienced in that particular territory in which he is located, then by a simple process of multiplication determine the annual gas requirements. Heat loss calculations based on the latest coefficients found in the A.S.H. & V.E. *Guide* are the foundation for the estimate. Short cut methods are to be frowned upon and guessing is not to be tolerated. When a customer is being asked to make a major expenditure for a heating plant that will burn one fuel only he is most certainly entitled to an operation estimate that is based on facts and which can be depended upon. It is essential that estimates of cost of operation be very close to what the actual bills will be. To place the estimate any higher will jeopardize the sale and if the bills exceed the estimate a dissatisfied customer is the result.

Gas Company's Interest in Heating System Is Permanent

The public regards the gas company as a responsible corporation—and has a right to expect complete satisfaction from anything purchased from it. The gas company also has a perpetual interest in a heating job because of the monthly sales of its fuel, and must service and live with the job forever. Consequently, no half-way measures can be tolerated. The installation must be as near perfect as possible.

HOUSE HEATING DATA

STD. FORM 431-1 NAME_____ ADDRESS_____ TYPE OF FUEL USED HEATED

YEAR	TEMPERATURES		ESTIMATED HEATING		ACTUAL HEATING								SAVING IN DOMESTIC DUE TO REDUCED RATE
MONTHS	ACTUAL	NORMAL	CONSUMPTION	COST	CONSUMPTION	COST	CONSUMPTION	COST	CONSUMPTION	COST	CONSUMPTION	COST	
OCTOBER													
NOVEMBER													
DECEMBER													
JANUARY													
FEBRUARY													
MARCH													
APRIL													
MAY													
HEATING SEASON													
RATE PER M.C.F.													
JUNE													
JULY													
AUGUST													
SEPTEMBER													
TOTAL 12 MONTHS													
RATE PER M.C.F.													

INSTALLED RADIATION_____ REQUIRED RADIATION_____ WARM AIR LEADER PIPE AREA_____ ESTIMATED GAS CONSUMPTION_____ BASED ON_____ DEGREES ACTUAL TEMP. MAINTAINED_____ DEGREES

PREVIOUS FUEL USED_____ COST $_____ ESTIMATED GAS COST $_____ BASED ON RATE_____

PREVIOUS EQUIPMENT_____ DATE OF ESTIMATE_____ 19___ ESTIMATED BY_____

NUMBER OF ROOMS HEATED_____ CUBICAL CONTENT_____ SOLD BY_____ INSTALLATION BY_____

CONSTRUCTION OF HOUSE_____ INSTALLATION COST $_____ EQUIPMENT COST $_____ TOTAL COST $_____

AVERAGE MONTHLY CONSUMPTION PREVIOUS TO INSTALLATION_____ TYPE OF INSTALLATION_____

REMARKS_____

Fig. 3. Gas Consumption Record Kept for Each Gas House-Heating Customer

Keeping the customer satisfied with his gas bills would be easy if weather conditions could be controlled. Estimates are of necessity based on average weather conditions. As long as normal weather conditions are experienced the actual gas bills will compare favorably with the estimate submitted, but when unusual weather conditions prevail the bills vary considerably from the estimate.

Company Keeps Record of Gas Consumption of Each Customer

During the first heating season the bills will be watched closely by the customer. As long as they remain below the estimate he is happy, but when they exceed the estimate he begins to worry. In cases where gas and electricity are sold by the same company, and charges for both classes of service are made on the same bill, the customer is prone to consider the total of all as the gas bill. It is essential that the gas company keep a record of each job.

A form such as exhibited in Fig. 3 enables the house-heating engineer to know the facts in connection with each installation. If he also keeps an actual record of the mean temperature for each day of the heating season and calculates the number of degree-days, he then has all the data necessary to determine whether or not the bills are running as they should. Installations having too high gas bills should be investigated with a view to locating and removing the cause of the high bills. This voluntary investigation in advance of a customer complaint builds good will and confidence in the customer's mind and will aid in the growth of the business. The recommendation of a user will do more to close a prospective buyer than all the fancy tricks of a high-pressure salesman.

Fig. 4. Gas-Fired Hot Water Boilers Make an Attractive and Compact Installation

While the use of building insulation brings down the cost of heating, and its widespread use will unquestionably widen the field for gas-heating sales, we must realize that a building does not have to be insulated to be heated with gas. To date there are many more gas-heating insulations in uninsulated

Fig. 5. Commercial Buildings, as Well as Residences, Are Heated by Gas in Territory Served by Northern Indiana Public Service Company

homes than there are in insulated homes. This condition probably will reverse itself in time.

The next few years will no doubt see an increased activity in the use of conversion equipment, by which is meant gas burners to be installed in equipment originally designed to burn coal. The customer installing such equipment must, in most cases, be prepared to buy from 5% to 15% more fuel than he would if he used gas-designed equipment.

Many of the burners offered sell for much less than gas-designed equipment, but one must not overlook the protective devices and controls with which gas-designed units are equipped, nor should he fail to consider the service which he may reasonably expect to receive from the equipment he buys. The manufacturers of conversion burners should be sure that the equipment they offer will operate just as dependably as gas-designed equipment.

Gas companies will not be interested in selling equipment which will fail at inopportune times and cause expensive service charges, to say nothing of the mental attitude of the customer who is annoyed with interrupted heating service.

The conversion field should be entered cautiously —neither the performance of one job nor a half-dozen will be conclusive proof that all the problems have been solved. Here again installation is a vital factor in the successful performance of a conversion burner. Warm air particularly will present difficulties. Care must be taken to mount the burner sufficiently low so as to obtain every possible square inch of heating surface, and yet high enough to prevent radiant heat from interfering with proper air circulation down the cold air returns in warm-air installations.

Conversion Systems Will Broaden Field of Gas Heating if Undertaken Cautiously

Obviously, conversion installations should never be made in leaky furnaces, or in systems where air circulation as required by the Standard Code cannot be obtained. Chimney drafts should be reduced to such a point that the heat will not be pulled out before the furnace has been able to absorb it from the products of combustion. This precaution also applies to boilers. With the latter the problem of conversion is not as difficult as it is with warm air, but great care must be taken to reduce all radiation losses to the basement to a minimum, and baffle the passage of gases as much as possible to enable a rapid heat transfer and avoid smothering the flame. Conversion applications undoubtedly will broaden the field of gas heating. They should be undertaken, but it will be wise to proceed slowly and carefully, keeping service and cost to the customer as the rule and guide to be followed.

Gas for space heating will be used more and more each year. Every gas company should attempt to secure as much of this business as its manufacturing and distribution capacity will permit, and every heating contractor should recognize the opportunities this field opens to him for increased business and profits.

How One Heating Contractor Looks on Oil Burning

(*Continued from Page 67*)

evident from the above figures that the utility of such a boiler for the use of oil fuel is open to question. I am convinced that the proper type of boiler is one so constructed that there will be no divisions, or baffles in the water-circulation area.

My judgment as to the type of burner to be used may be open to question, but I cannot believe that a pot-type or internal burner is the proper device for a long, narrow boiler. The lowness of the construction of the water legs, which are designed to reach into the gases of the solid fuels, prevents the lowering of the flame of the oil burner to such a degree that it will permit sufficient radiant heat to heat evenly all the sections.

From the above discussion let us turn to another example of how inefficient the modern adaptation of oil fuel may be to one of our common heating systems.

The condition which I am about to explain came under my own observation, and while no actual tests were made, the impossibility of the situation will be clear enough from the description.

The plant was an indirect steam system, in a residence. All the air was taken from the outside. The regulating thermometer was placed in the center of the house. Generally it would not be placed on an outer wall, or where it would be directly within the effects of the air coming from the registers. During the time the burner was working, it certainly produced beautiful heat. But shortly after the burner was shut down, and the indirect stack had cooled down, the blast of cold air still pouring into the room would not have opportunity to circulate enough to lower the temperature so that the regulator would start the burner again, and the area near the registers would become too hot.

The difference in temperature between the center of the house and those parts just a few feet from the registers would often be from eight to ten degrees. With a regulator placed within the area of these cold places, the burner would be constantly going on and off with the result that in the center of the house it would be unbearably hot.

When coal was used in this same system, it had been an ideally-heated home. The owner was a manufacturer whose business frequently called him away from home for two or three days at a time. He wanted to rid himself and family of the trouble of tending a fire and handling ashes. He had either to cut up his house and install a recirculating system, or take the air from the cellar, where it was more or less permeated with oil, or pull out his indirect, and install direct radiation. The only other possibility was to go back to burning coal. At the present time, he has not decided which change he will make. He complains of inefficient heat, and is waiting for a high- and low-flame burner which will solve his problem.

Use of Trench Digging Machine Established Low Record for Installation Costs

Central Heating in Detroit

II—Arrangement of the Company's Plants and Distribution System Based on Extensions Made During 1928

By E. E. Dubry

Assistant Superintendent of Central Heating, The Detroit Edison Company

IN Detroit, the general scheme of distributing steam is by the feeder method, although part of the plant output is fed by the direct method. The feeder plan of distribution consists of a high-pressure main leaving the heating plant and running to some point in the street main network supplying a known district. Street mains carry a nominal pressure of 35 lbs. from which individual services are taken to each customer. The pressure guaranteed the customer at the building entrance is 10 lbs., the difference between this and the street mains being partly pressure drop in the services and partly a factor of safety.

A street pressure of 35 lbs. was established as a safe working pressure on all radiators, building fittings and accessories, should the customer's reducing valve fail to function.

The feeder pressure is constant at the point where the steam enters the network, while the pressure at the plant end varies from 35 lbs. to boiler pressure, depending upon the quantity of steam required in the network. All new construction is designed for these pressures.

In the older sections of the system the street pressure is somewhat lower, due to the age of the underground piping and the type of material used, since some of it is cast-iron construction designed for a pressure of 2 lbs. at the customer's service. These old street mains continue to serve their original districts very successfully with the assistance of modern high-pressure mains which were installed in recent years.

Parts of the district adjacent to the heating plants are fed direct at the street pressure existing in that district.

All pressure regulation is controlled from the heating plants by the regular operating force, using long-distance recording-pressure gauges and man-

16-In. Steam Main and 8-In. Return Before Completion of Wooden Form for Concrete Envelope

ually-operated special valves or reducing valves. Because of the importance of these gauges and due to their rather delicate construction, they are always installed in duplicate, and the present practice is to use different routes from the point at which they are located in the network to the plant so that any disturbance along the route will affect only one gauge. They are usually run in a spare cable duct of the electrical system.

There are only four customers who are served with high-pressure steam. Three of them are in the old part of the system and require service to fire pumps, special apparatus, etc., while one, although a recent connection, has a definite time limit and this customer installed his own high-pressure service beginning at our property line.

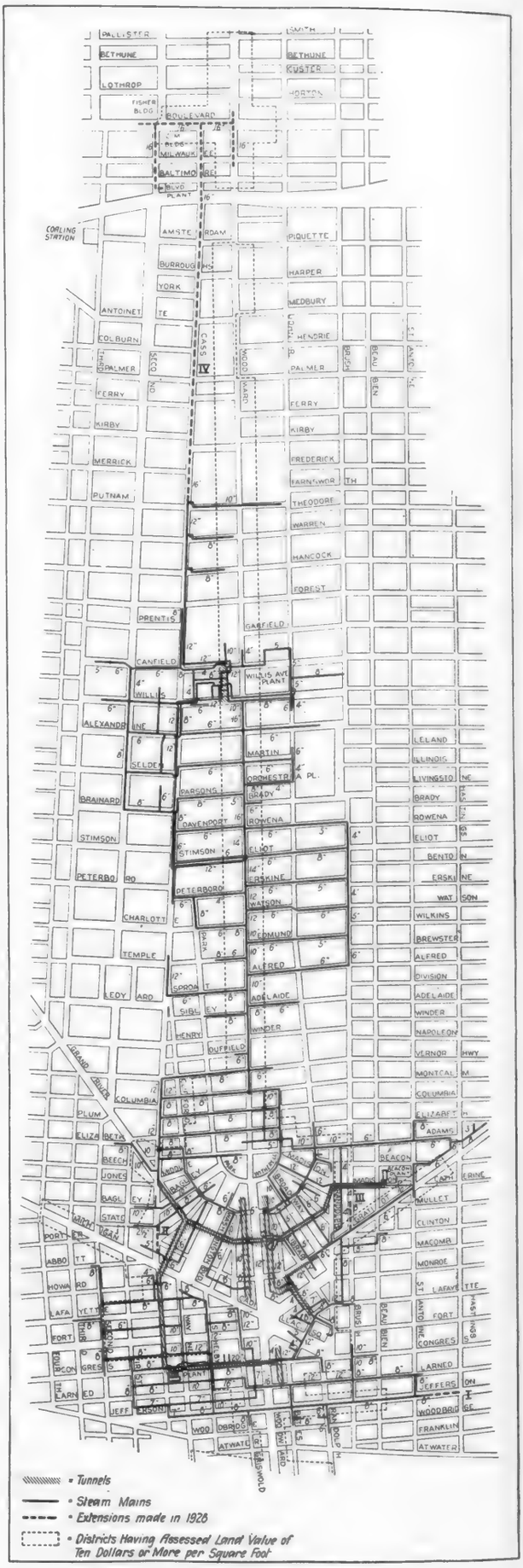
In time all high-pressure customers will be eliminated because of the excessive cost necessary to provide a separate high-pressure distribution system and because of the small demand for high-pressure steam. With the exception of high-pressure steam for laundry mangles, which can be easily provided by an oil or gas-fired boiler or by electric equipment, there is no demand for steam at a pressure greater than 10 lbs.

As far as possible the system is separated into areas which, under normal operation, are valved off from the adjacent areas. This has the advantage of making it possible to determine the load required in certain areas and the corresponding feeder requirements. In case of trouble it is easy to determine which valves must be operated to aid the troubled area and how much extra steam can be supplied by it without jeopardizing the entire system. Serious trouble likewise can be isolated, only affecting a small portion of the total.

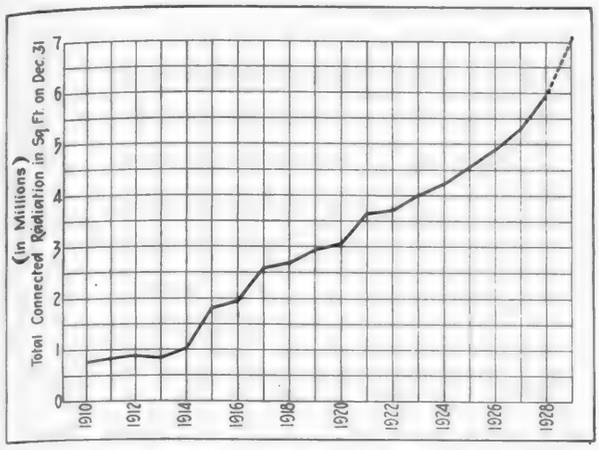
This scheme will be worked out more definitely as future extensions are made because of its advantage over the older loop type of distribution system in which the connecting pipe line between areas was depended upon, during normal operation, to carry an almost unknown quantity of steam. With the older method, in case of trouble it was not easy to determine how much extra steam could be shifted from one area to another through this connecting loop.

When estimating either plant peak loads or feeder peak requirements during any part of the year, the accompanying chart has been used successfully and found to be very reliable. Take any temperature and read the corresponding pounds of steam required per square foot of radiation, multiply by the radiation served; this gives the maximum demand in pounds per hour. Note that this includes line losses and is the maximum demand at the plant end of the feeder in question.

Although there are other schools of thought regarding steam distribution, the feeder system as used in Detroit has proved to be very successful, adapting itself to a constantly-changing and rapidly-growing system without replacing the original street main network and always maintaining the same high quality of service.


Tunnels
Steam Mains
Extensions made in 1928
Districts Having Assessed Land Value of Ten Dollars or More per Square Foot

Section of Detroit Served by Central Heating System



Connected Radiation Load, Detroit Edison Company

In a recent study which was made in an attempt to predict the quantity of future business and its probable location, it was indicated that property value has a definite relation to the demand for central heating service, which is shown in the map.

Summary of Extensions to the System During 1928

1. One third of the old Willis Avenue boiler house dismantled and rebuilt.
2. One 2565 H.P. boiler installed at Willis Ave.
3. Remodeling piping, electrical bus, etc., to accommodate two boilers.
4. Purchase of an existing heating plant with four 500 H.P. boilers.
5. Started the installation of one 4150 H.P. boiler unit at the Beacon Street heating plant.
6. Started the construction of the Dequindre Street coaling station, having a normal unloading capacity of 300 tons per hour.
7. Main extensions as noted on the map consist of:

I.	442 ft. of	8	in.	main.
II.	369 ft. of	8	in.	main.
III.	485 ft. of	8	in.	main.
IV.	9432 ft. of	16	in.	main.
	44 ft. of	12	in.	main.

The service is extremely popular in Detroit for office buildings and store buildings and to a slightly lesser degree for hotels and apartment buildings. Practically all new buildings erected within the district are connected to the system and few of them have chimneys or space reserved for boilers.

One feature of the company's service which has helped to make it popular is cooperation with the customers in the effort to reduce the amount of steam consumed. It has been evident for many years that much heat is wasted in the average building by careless operation. The company maintains a staff of engineers who assist customers in the handling of their systems and cooperate with architects in the design of new buildings.* The success of these educational methods is apparent in the following table showing the steam consumption from year to year.

Average Amount of Steam Used For Each Square Foot of Radiator Surface Per Degree Below 70° F.

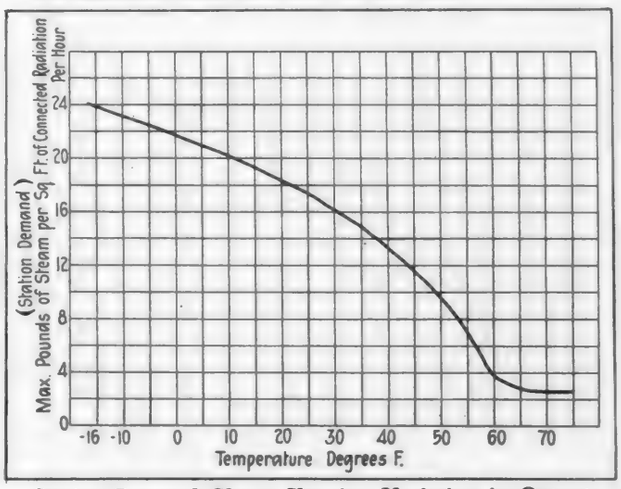
Year	Lbs.
1921	17.1
1922	16.1
1923	15.
1924	15.42
1925	14.67
1926	14.6
1927	13.6

The company recently adopted an interesting new method of charging certain types of consumers for heating service. Heating service has, for many years, been sold on a meter basis, that is, a steam flow meter or a condensation meter indicates the amount of heat used and the consumer is charged accordingly, at so much per 1000 lbs.† With the new method of charging, the consumer pays a "demand" charge based on the average of his three highest peak loads for the winter, and a moderate "consumption" charge for the steam that he uses. This rate, which is optional to the consumer, results in a lowered heating cost to the hotel, club and apartments, which are necessarily long hour users.

There is ample promise in Detroit for the continued popularity and growth of the service in its proper field, which appears to be limited to the densely-built business sections where large loads can be served with a minimum investment in distribution mains. With oil and gas taking their place as popular methods of heating residences it is not probable that central heating in a large city such as Detroit will become universal. In the business district where basement space is valuable and where freedom from dirt and ashes and from the nuisance of operating the individual plant have a real value, the service will undoubtedly continue to be in great demand.

*See "Economical Utilization of Heat from Central Station," by N. W. Calvert and J. E. Seiter, presented before the American Society of Heating and Ventilating Engineers, January, 1924.

†The Detroit rate is
For the first 100,000 lbs. per month, $1.30 per 1000 lbs.
Discount for prompt payment, 10%.
For additional steam, $1.00 per 1000 lbs., net.



Station Demand Chart, Showing Variation in Output with Fluctuation of Outdoor Temperature

The Heating & Ventilating Magazine

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SO many inquiries have reached this office as to the proposed addition to the New York State Building Code, known as Part II, that we present herewith its salient provisions as far as they pertain to heating and ventilating.

Part II is devoted entirely to the equipment and arrangement of places of public assembly, such as theatres and assembly halls. It refers not only to future buildings, but to any structures already built which are to be used hereafter as places of public assembly.

Under the heading of "Heating and Ventilation," Rule 254 reads:

"(a) Sufficient and proper heating and ventilation shall be provided and maintained during occupancy of theatres and assembly halls hereafter erected and used as places of public assembly to insure health and comfort, and maintain the following requirements;

"*Space per occupant*: (b) There shall be provided not less than 90 cu. ft. per air space per occupant in the auditorium.

"*Air Supply*: (c) Every building hereafter erected and used as a place of public assembly shall be provided with a ventilating system which will supply at least 1200 cu. ft. per hr. of fresh outdoor air from an uncontaminated source for each person accommodated in the auditorium and which will also change the air at least six times per hour in all other occupied parts of the building, except where the window area opening directly to the outside air equals or exceeds one-eighth of the floor area of the room, subject to the approval of the enforcing authority. No vitiated air shall be reheated unless it has been washed by a mechanical air washer of design approved by the enforcing authority."

Under "Heating Apparatus" (Rule 254) the proposed code reads:

"(a) Steam boilers shall be located outside of the theatre proper and in no case under or within any portion of the theatre building; the space allotted to the same shall be enclosed by walls of brick or concrete at least 12 in. thick on all sides, and the ceiling of such space shall be constructed of fireproof materials. Each doorway in said walls connecting with the building shall have an automatic fire door.

"(b) No floor register for heating, ventilating or other purposes shall be permitted in aisles, corridors or passageways.

"(c) All blowers used to circulate air through heating or ventilating pipes with openings to the auditorium shall be provided with a device to stop the blower automatically in case of fire. The device for this purpose shall be located near the blower, both inside and outside the pipe, leading to openings in the auditorium.

"(d) No coil, radiator or pipe shall be placed so as to obstruct any aisle or passageway. Any exposed radiator or coil shall be guarded.

"(e) Boilers carrying a steam pressure of more than 15 lbs. shall conform to the requirements of the New York State Boiler Code."

While action is not imminent on the adoption of Part II, a definite movement is under way on the part of the New York State Department of Labor to secure its enactment as law. What is causing the most concern to heating men is the archaic provision for a system capable of supplying at least 1200 cu. ft. per hr. of "fresh outdoor air from an uncontaminated source for each person accommodated in the auditorium."

Recirculation and reconditioning of air, particularly in theatres, presents no insurmountable difficulties from a hygienic standpoint and they are costly enough processes without this additional requirement.

THE whole movement smacks of the days when the compulsory ventilation laws were enacted in many of the states. Much water has flowed under the bridge since that time, and, while the "fresh outdoor air" provisions of the old laws are still in effect, that is no reason for perpetuating a practice which long since has been superseded by other and better methods.

It looks now as if, in New York State, at least, we are likely to reap the consequences of our inaction in permitting the compulsory ventilation laws to remain on the statute books so long in their present form.

Increased Attention to Customer Service Urged at Convention of National Warm-Air Heating Association

James M. Triggs, New President of the National Warm-Air Heating Association

AT the 16th annual convention of the National Warm-Air Heating Association, held at the Claypool Hotel, Indianapolis, Ind., April 9-11, manufacturers and dealers were urged to give greater service to the customers in order eventually to secure greater profit. The program was made up of subjects dealing with the various phases of the industry such as costs of manufacturing, publicity and proper installation.

At the first session President Charles E. Hall introduced Richard Miller, investment banker and past president of the Indianapolis Chamber of Commerce, who welcomed the convention to the city. Mr. Miller emphasized the fact that this is an era of continuous change and that business men must be alert to keep pace with the rapid change in conditions. He touched on the tendency of times toward consolidations and said that even with the mass production, so general in the industry today, there is still a decided place in many industries for the small individual business.

W. B. Burruss made a most inspiring address on "Profit and Loss." In his talk Mr. Burruss discussed at some length the evils of price cutting and the necessary methods in planning to operate a business at a profit. Touching on the price situation, he said that in many cases the price does not enter into consideration when a man is buying for his individual needs but often considers it all important when selling something for the other person's needs.

In his annual report, Allen W. Williams, managing director of the association, stated that six new members had been added during the year and nine had been lost through consolidations and resignations. A gain in the associate membership of 76 brings the number in this class to 280. Mr. Williams also presented statistics showing that although there had been a decrease in the number of furnaces made in 1927, from those made in 1925, the shrinkage was due to business conditions rather than to loss of prestige, as the figures also showed about the same percentage of loss in the number of steam and water heating-boilers.

In his paper "The Domestic Automatic Stoker," K. C. Richmond of St. Louis, told of the possibilities in the domestic furnace stoker field. Mr. Richmond stated that the small stoker for the warm-air furnace is the coal industry's answer to the oil burner and the gas-fired warm-air furnace.

H. B. Johns, of the Peoples Gas Light and Coke Co., Chicago, presented an illustrated lecture on the gas-fired warm-air furnace in which he told something of the history of gas house-heating, the methods used in the manufacture of gas and gas house-heating costs. The approximate cost of firing with gas was stated to be about $40 per room per season or about 50% more than coal. Insulation reduces this cost about 20%.

The speaker said that with a good Standard Code installation, the cost of heating is 10% less with warm air than with steam and water systems. About 30% of the installations made by the Peoples Gas Light and Coke Company are warm-air systems.

A visit was made by the members of the association through the new field house of Butler University, Indianapolis, heated by warm-air furnaces.

At the Wednesday morning session, Prof. J. D. Hoffman, head of the department of practical mechanics, Purdue University, and chairman of the Standard Codes Committee, explained that several minor changes were made in the code. These changes are all embodied in the sixth edition. Professor Hoffman further stated that the code now is as nearly correct as it is possible to make it.

The chairman of the Better Business Committee, I. L. Jones, treasurer of the International Heater Co., Utica, N. Y., outlined the work of that committee and explained that it is in charge of coordinating the efforts of the association as a whole. He touched on the work of the field representative and stated also that a mailing list of approximately 20,000 dealers had already been compiled. It is planned to lay out a Standard Code formula blank, a sketch sheet for estimating work, a standard contract form and an estimate blank.

Jack Stowell, of Aurora, Ill., and field representative of the Better Business Committee, was then introduced and gave a talk on the application of the Standard Code. Mr. Stowell said that the time to call the attention of a customer to a poor chimney is before the installation is made. The furnace installer should state the reasons why the chimney is faulty before installing and not give alibis afterward. He then explained the extra percentages allowed when estimating warm-air installations.

A questionnaire on the subject of oil burning in warm-air furnaces was sent to the furnace manufacturing members of the association, and the principal oil-burner manufacturers by F. G. Sedgwick and the answers constituted the basis for his paper on this subject.

Mr. Sedgwick stated that the replies were both disappointing and illuminating; disappointing in that they showed that most of the oil-burner and furnace manufacturers knew no more about the subject than he did, and illuminating because the replies showed conclusively that it was the opinion of those addressed that oil burners, when used in warm-air furnaces as constructed for burning coal, are satisfactory. In reply to the question, "Is it practical to use oil burners in warm-air furnaces as now commercially made for coal?" the answer was in the affirmative. A few manufacturers qualified their replies by stating that the furnace must be permanently tight.

A unanimous "no" was received as the answer to the question, whether the fire hazard was greater when oil burners are used with warm-air furnaces

than when coal is burned. When asked what type of furnace is best adapted for use with oil burners, the manufacturers avoided a direct answer but placed emphasis on the necessity for tightness and a large amount of heating surfaces. A question as to minimum and maximum stack temperatures in oil-burner installations elicited the reply that from 322° to 377° should be the minimum and from 560° to 590° should be the maximum.

Only one furnace manufacturer answered the question as to how many square feet of heating surface there should be in reference to the fuel burning capacity of the burner, and his reply indicated that the furnace should have 68 sq. ft. of radiating surface per gallon of oil burned per hour.

Mr. Sedgwick stated that he believed there is a greater likelihood of leakage of oil in a warm-air furnace installation than in a steam or water installation unless a welded steel furnace is used. In the case of cast-iron furnaces particularly great care should be taken to see that all joints are sealed tight. No installation should be made in an old furnace without a complete dismantling and resetting of the furnace.

Warm-Air Systems Should Conform to Standard Code Before Burner Is Installed

Instructions were given by the author to dealers who install oil burners in warm-air furnaces. The first step that should be made by the furnace dealer is to see that the job is a Standard Code installation and that the furnace is easily large enough to carry the load. An oversize furnace is even more desirable in an installation burning oil than with one burning coal.

The second step is for the dealer to make absolutely certain that the furnace is tight. The third step is properly to insulate the ashpit, if the burner is to be installed in the ashpit, so that the heat in the cold air boots will not retard the circulation of air. The last step, recommended with some types of burners, is the building of a brickwork construction inside of the furnace body, so as to properly deflect and retard the travel of the oil flame, and to supply a heat storing reservoir wherever an intermittent type of burner is used.

Bulletin 189 of the Engineering Experiment Station of the University of Illinois was distributed at the convention. This bulletin is a continuation of the report on the research being carried on by the university in cooperation with the National Warm-Air Heating Association.

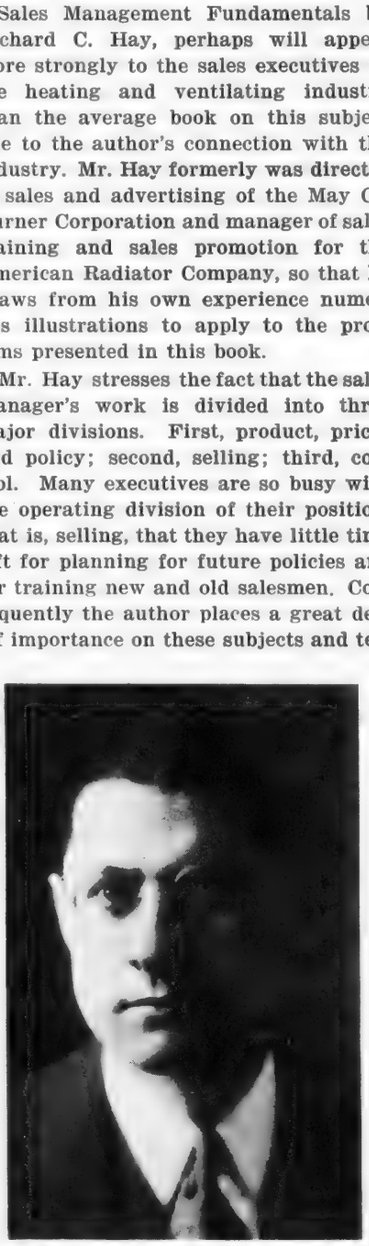
Three new members were elected to the association: St. Clair Foundry Co., Centralia, Ill.; Schill Bros. Co., Crestline, O., and the Peerless Foundry Co., Indianapolis, Ind.

The new officers of the association elected at the convention were: President, James M. Triggs, Huntington, Ind.; first vice-president, Charles Seelback, Cleveland; second vice-president, H. T. Richardson, New York; managing director and treasurer, Allen W. Williams, Columbus, O. C. M. Lyman, eastern sales manager of the International Heater Company was made honorary chairman of the Research Advisory Committee, and J. F. Firestone was elected chairman. Prof. J. D. Hoffman will continue as chairman of the Standard Code Committee. H. T. Richardson was elected chairman of the Publicity Committee.

Sales Management Fundamentals

Sales Management Fundamentals by Richard C. Hay, perhaps will appeal more strongly to the sales executives in the heating and ventilating industry than the average book on this subject due to the author's connection with the industry. Mr. Hay formerly was director of sales and advertising of the May Oil Burner Corporation and manager of sales training and sales promotion for the American Radiator Company, so that he draws from his own experience numerous illustrations to apply to the problems presented in this book.

Mr. Hay stresses the fact that the sales manager's work is divided into three major divisions. First, product, prices and policy; second, selling; third, control. Many executives are so busy with the operating division of their position, that is, selling, that they have little time left for planning for future policies and for training new and old salesmen. Consequently the author places a great deal of importance on these subjects and tells in detail the methods he has used and has seen used for training young and senior salesmen.



Richard C. Hay

The branch manager, important as he is, has not had nearly the thought given to his methods and problems that has been given to the problems of his superior, the sales manager, or to his assistants, the salesmen in the field. A chapter is devoted to the subject of branch sales management, dealing with the control of salesmen, the reports which the branch managers should keep and send in to the sales manager, the assignment and routing of salesmen, and suggestions to the branch manager for following up the work of the individual salesman.

No description is given of the myriads of quota plans for stimulating salesmen's results but rather the author has outlined the problem of using sales quota in selling in such a manner as to enable the thoughtful sales executive to work out a plan for himself. In the chapter on sales promotion, this phase is defined as the organized effort applied to the selling job to secure greatest effectiveness for advertising and for dealer helps. One of the most interesting chapters in the book is that on sales management problems of the small manufacturer. This chapter is divided into five parts: (1) perfecting products; (2) study of past sales results; (3) study of sales opportunities; (4) plans and methods for increasing volume and profit, and (5) operating a control system for putting plans into effect.

The appendix contains an outline for an analysis of a sales department and an example of a difficult analysis, the latter being a skeletonized description of the various problems a salesman may meet in completing a sale, so that the weaknesses of a salesman can be discovered and corrected. The bibliography on resale lists numerous articles on this important subject from periodicals, books and house organs. The book is well indexed.

Sales Management Fundamentals has been indorsed by the New York Sales Managers' Club because in their opinion it represents a common-sense and practical statement of the high points in sales management.

Published by Harper & Bros., New York. Size 6 in. by 9 in. Pp. 249. Price $3.50.

Arc Welding, containing the Lincoln prize papers, is about to be issued by the American Society of Mechanical Engineers, 29 West 39th St., New York. This volume is the result of a special contest conducted under the auspices of the A.S.M.E. to obtain the best available information on arc welding. It will contain 450 pages and will sell for $5.

Effect of Radiation and Convection on Boiler Design

INCREASED speed of the hot gases in the flues and of the water in the tubes are recommended by T. Barratt in a paper read before the Institution of Fuel Economy Engineers, London. The author told of his experiments which showed that the amount of heat lost from a surface at a given temperature depends not only on the area and temperature of the exposed surface, but also on the shape and disposition of the surface.

In one series of experiments heat losses by natural convection and radiation from a heated wire in air were determined, and in another series steam was passed through a hollow copper cylinder. The total heat loss from the surface was determined by the measurement of the amount of steam condensed; this measurement was made for two cases, when the surface was bright and when it was dead black.

It was found that the total heat given off per unit of area was inversely proportional to the square root of the diameter of the tube. If the diameter of the tube was increased fourfold, the loss of heat by convection alone was approximately halved. The product of convection (excluding radiation) and the square root of the tube diameter was approximately a constant.

The author mentions a special report to the Food Investigation Board by Doctors Griffiths and Davis in which they tell of their observation that a marked decrease of radiation from one surface to another is caused by placing parallel partitions between the hot and the cold surfaces. For example, if a partition is placed halfway between the surfaces its temperature will be approximately intermediate between those of the two surfaces, thus reducing the radiation one half. Two such surfaces will reduce radiation to one third, and so on. This is what occurs in such substances as cotton wool and other thermal insulators which reduce radiation almost to zero.

The accompanying diagram, from Mr. Barratt's report, was plotted from the results of the author's experiments and experiments reported by such investigators as Langmuir, Ayrton and Kiljour, etc. A point illustrated by this graph is that the convection loss per unit area for small diameters decreases rapidly as the diameter increases, but that for diameters above 5 cm. (2 in.) the loss per unit area is nearly constant.

The laws of radiation of heat indicate that, owing to the operation of the fourth-power law, the amount of heat absorbed by a surface rises very rapidly as the temperature of the radiating body increases. For example, the heat received by a surface at 300° F. is more than doubled if the temperature of the furnace is increased from 2000° F. to 2400° F., absolute.

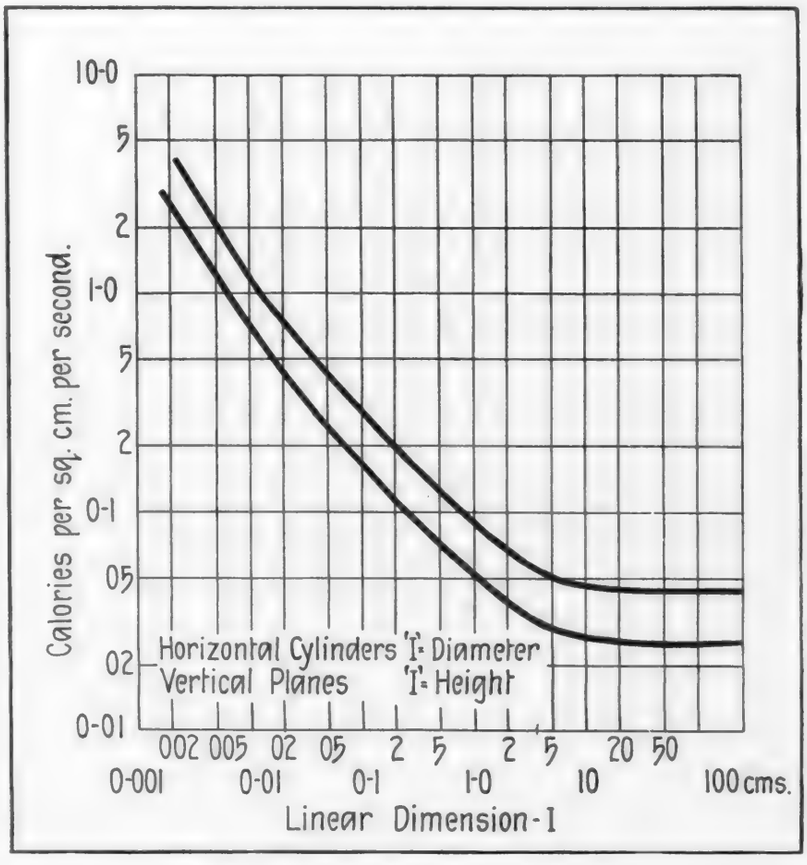
The laws of convection of heat, applying equally well to the heat transferred from the hot gases to the tube or boiler surface, and from the tubes to the water inside them, show that for a rise of temperature of the furnace gases from 2000° to 2400° F., absolute, the increase in the heat given to the boiler tube by convection is only 25%, even under the most favorable conditions.

There is an inert film of gas on the furnace side of the boiler tube which is untouched by convection currents, but which can be pierced by the radiation. This film may be 1/50 in. in thickness, though doubtless this varies with the temperature and with the speed of movement of the furnace gases. It has been estimated that 95%-98% of the convected heat is lost in forcing its way by conduction through this film of gas, and largely owing to this fact the outside of the tube is usually only 50° to 100° hotter than the inside.

There is also a "dead water film" in the inside of the tube, whose influence on the transfer of heat from the tube to the water depends on the velocity of movement of the latter. It is probable that 2% or 3% of the heat received by the tube, both by radiation and convection, is lost in forcing its way past this water film.

It is not difficult, in view of these considerations, to understand the superiority from the point of view of efficiency of tube boilers over other types. A water-tube boiler can offer a relatively much larger surface to direct radiation from the furnace, while even the fire-tube boiler depends to a very large extent on convection. Another advantage with the best type of tube boiler is that the circulation of water is systematic and rapid, thus tending to remove or reduce in thickness the inert film of water inside the tube.

The author therefore suggests that the area of the tubes exposed to direct radiation be increased; the employment of still higher furnace temperatures, and increased speed of the furnace gases outside the tubes, and of the fluid content inside them, in order to neutralize the effect of the "dead" films of gas and water.



Heat Emission by Convection per Unit Area

American Society of Heating and Ventilating Engineers

Discussion of Boiler Rating Code

IN presenting the proposed boiler rating code of the A.S.H. & V.E., at the annual meeting of the society in Chicago last January, Alfred Kellogg, chairman of the Committee on Rating Boilers, called attention to the previous attempts on the part of the society and other organizations to formulate a satisfactory rating code, all of which efforts came to naught.

"The instructions given this committee at the time of my appointment," he stated, "were that a standard code for rating low-pressure heating boilers should be drawn for the guidance of boiler manufacturers in determining output; and that the data so obtained should be clearly stated in the manufacturers' catalog, to be known as the 'A.S.H. & V.E. rating.' This would not preclude manufacturers from publishing outputs based on other conditions of operation, but the statement of the society's rating would provide a yard stick by which purchasers could compare one boiler with another, regardless of make or design."

Very early in its work the committee concluded that it would be possible to furnish the boiler-buying public with what might be called a "one-figure rating." In explanation of this term, Mr. Kellogg stated that "from performance curves obtained by the manufacturer from actual tests, definite points thereon can be charted in simplified form, so that the purchaser of a boiler may know that the boiler will carry its load through any extreme weather condition likely to be met. The question of efficiency under such conditions is of secondary importance because a "one-figure rating" naturally would be one that would carry it through the peak loads, which might occur two or three times during a winter.

Referring to the chart which accompanied the report (Fig. 1), Mr. Kellogg called attention to the curve of flue-gas temperature, which shows a sharp temperature rise at about the 4000 sq. ft. rating. It was realized, he said, that 90% of the total boiler sales are of 1200 sq. ft. or less capacity. Therefore, it was felt that in those small sizes it would be permissible to allow a temporary increase in flue-gas temperature above normal, keeping in mind the very short period in which boilers operate at maximum output.

At this point Director F. C. Houghten, of the A.S.H. & V.E. Research Laboratory, explained in detail the method of rating a boiler in accordance with the code. Fig. 2 shows typical boiler performance curves, obtained from tests, superimposed on the rating chart. The heavy black lines are the performance curves and the heavy dash lines are the curves from the rating chart. Boiler output is plotted on the horizontal ordinates, with draft, efficiency, flue-gas temperature and combustion rate plotted on the vertical axes.

To rate the boiler whose performance curves are indicated by the heavy lines, locate the intersection X of the flue-gas performance curve A and the flue gas limitation curve A^1, and the intersection of the combustion rate performance curve B and the combustion rate limitation curve B^1 at Y.

X and Y projected to the horizontal axis show that the boiler outputs at these points are 4030 sq. ft. and 6740 sq. ft. of steam radiation, respectively. Provided that the performance curves were plotted from tests showing the required percentage of CO_2 in the flue gases and not over 2% moisture in the steam, the rating of the boiler will be the lower of the two outputs X and Y plus 30% of the difference, or 4030 plus 0.30 (6740 — 4030) = 4843 sq. ft.

According to the code, the A.S.H. & V.E. rating of this boiler is stated as:

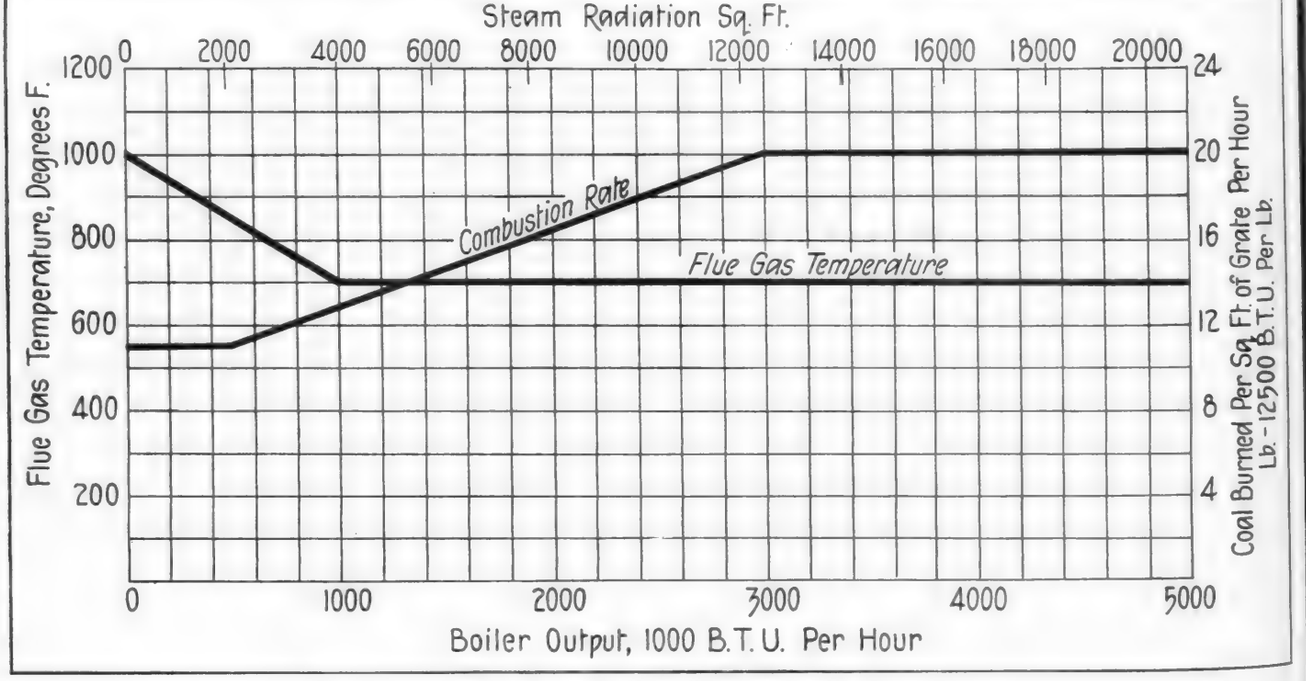


Fig. 1. A.S.H. & V.E. Boiler Rating Chart Showing Limitation Curves

RATING DATA

Fuel—stove size anthracite.

Rating output—4843 sq. ft.

Smokehood draft at rating output 0.21 in. water.

Average flue-gas temperature at rating output 800° F.

Average rate of combustion at rating output, 8.7 lb. per sq. ft. of grate per hr.

As was stated by President Willard, while the code was under discussion, it was the society's intention to appoint a continuing committee for the purpose of interpreting the code and of suggesting amendments from time to time, based on experience gained through its use.

Immediately upon the adoption of the code, such a committee was appointed, known as Committee for Interpreting Code for Rating Low-Pressure Heating Boilers, with the following personnel: L. A. Harding, chairman; R. V. Frost, and F. C. Houghten.

Before giving the code general publicity, the Committee on Interpretation of Code addressed a letter under date of February 11, to the boiler manufacturers. In this letter the committee quoted in full Section 5 of the A.S.H. & V.E. Code of Minimum Requirements for the Heating and Ventilating of Buildings, which refers to a method to be used in determining the load to be carried by a boiler for any steam or hot water installation. As was stated by the committee, it was thought that Section 5 might have bearing on the answers to some of the questions on which the committee desires information.

SECTION V

Minimum Capacity and Installation Requirements for Low-Pressure Steam and Hot Water Heating Boilers

(1) Estimated Boiler Load: For the purpose of this code the estimated connected load to the boiler or boilers employing solid fuels stated in B.T.U. per hour shall be taken as the sum of:

(a) The estimated heat emission in B.T.U. per hour of the connected radiation, direct, indirect or both, to be installed as determined by computation from data given in Sections II and III for normal operation.

(b) The estimated maximum heat in B.T.U. per hour required to supply water heaters or other apparatus to be connected to the boiler or boilers.

(c) The estimated heat loss in B.T.U. per hour of the piping connecting radiation and other apparatus with the boiler or boilers (see Table I at the end of this section).

(d) The estimated increase in the normal load in B.T.U. per hour due to starting with cold piping and radiation. This increase is to be based on the sum of items (a), (b) and (c) and shall be assumed not less than the following:

Sums of Items (a), (b) and (c) in B.T.U. per hour	Percentage Increase to be added
Up to 100,000	65
100,000 to 200,000	60
200,000 to 600,000	55
600,000 to 1,200,000	50
1,200,000 to 1,800,000	45
Above 1,800,000	40

(2) Boiler Capacity to be Installed: The boiler or boilers to be installed shall be guaranteed by the manufacturer of the boiler to be capable of supplying, at the boiler outlets, the total B.T.U. per hour as computed by the method outlined in the preceding paragraph and under the following conditions of operation, each of which is to be stated in the specifications covering the installation for which the boiler or boilers are intended.

"It will be observed," said the committee in its letter, "that the responsibility of correctly determining the maximum boiler output required, as well as the output for the design load, does not rest with the boiler manufacturer—unless he also acts in the capacity of engineer." Other comments of the committee in this direction were:

(1) It is evident that the boiler or boilers selected must have as a primary requisite sufficient maximum output to handle the starting-up load (maximum demand) with the draft available from the chimney selected or recommended for the proposed installation. The starting-up load may occur frequently during the heating season, but is naturally of comparatively short duration. The question of fuel economy (efficiency) is of relative unimportance for this load.

(2) The boiler load as determined from the heat emission of the radiation and its connecting piping (design load) in general exists for only comparatively short periods (few days) during the heating season.

The question of fuel economy (efficiency) is also, in this case, relatively unimportant.

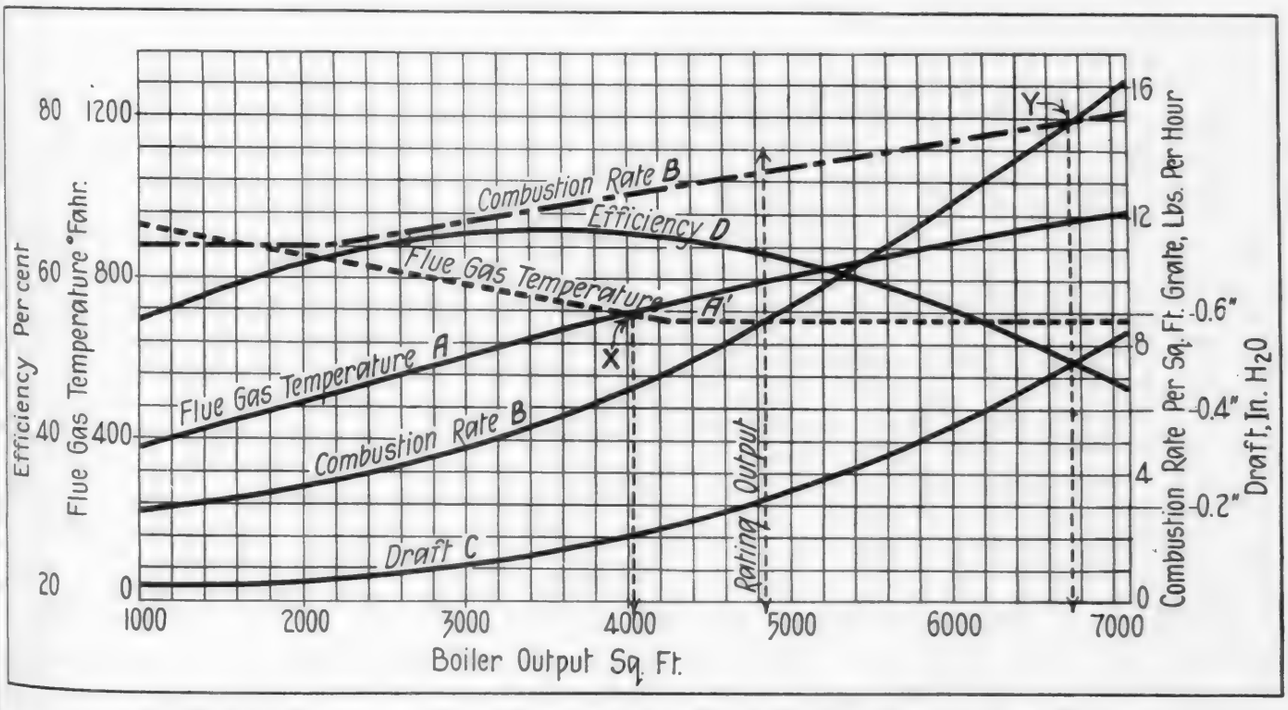


Fig. 2. Boiler Performance Curves Superimposed on Rating Chart for Determination of Rating

(3) The average operating load on the boiler or boilers for the heating season will probably not exceed 35% of the design load (2) in the average case.

Fuel economy (efficiency) for this average load is of considerable interest to the owner.

It will be observed that a small boiler, for example, must be capable of producing an output (with the chimney recommended) 65% in excess of the design load output. The ratios of the three loads will be: 1.65 (max. load); 1.00 (design load); 0.35 (average seasonal load), the average load being approximately 21.2% of the maximum load.

Questionnaire Sent to Boiler Manufacturers

In order to secure the manufacturers' ideas and opinions on the subject, the committee included in its letter the following questionnaire. The answers to this questionnaire will be made the basis of a special report of the Committee on Interpretation of Code which will be presented at the forthcoming semi-annual meeting of the American Society of Heating and Ventilating Engineers, at Lake of Bays, Ontario, June 26-28 next:

1. Do you believe that a manufacturer should guarantee the listed ratings of the boilers he manufactures under conditions of operation he may state and dimensions of chimney he recommends?

2. Do you favor a "one-number rating" for heating boilers? If so, what do you suggest as limiting factors to be employed by the manufacturer in determining the ratings listed?

Assuming the maximum load to which any boiler may be connected has been determined by the method as outlined by the A.S.H. & V.E. Code of Minimum Requirements previously given, what percentage of this load would you suggest the manufacturer employ in making up his published rating tables?

Do you recommend that the manufacturer state his percentage in his catalog?

Would you prefer in this case to recommend that the published rating be accompanied by a statement to the effect that the boiler (connected to the chimney listed) is capable of developing a certain percentage increase above the stated rating?

If, in your mind, the preceding suggestions do not appear practicable, how would you suggest this point be covered for the protection of the manufacturer as well as the engineer and contractor?

3. Do you favor a "multi-number rating" for heating boilers? If so, what limiting factors do you suggest be employed by the manufacturer in determining the ratings listed?

Assuming that the maximum load to which any boiler may be connected has been determined by the method outlined by the A.S.H. & V.E. Code of Minimum Requirements previously given, what percentage of this load would you suggest the manufacturer employ in making up his published rating tables?

Do you recommend the manufacturer state this percentage with the rating tables? Would you prefer in this case to recommend that published ratings be accompanied by a statement to the effect that the boiler (connected to the chimney listed) is capable of developing a certain percentage increase above the stated ratings.

If in your mind, the preceding suggestions do not appear practicable, how would you suggest this point be covered for the protection of the manufacturer as well as the engineer and contractor?

4. Do you prefer to see boiler output values stated in B.T.U. per hour or in square feet of "equivalent direct radiation" or both? If "equivalent direct radiation" is to be employed what B.T.U. values would you assign to (a) steam radiation, (b) water radiation?

5. Please state all of the information that you believe should accompany the rating tables as published by the manufacturer such as:

Size, kind and B.T.U. value of the fuel, grate area, dimensions of chimney, temperature of flue gas, rate of combustion, available fuel charge firing period, overall boiler and grate efficiency, etc.

6. Boiler manufacturers are requested to furnish this committee with output curves or performance tables for two boilers in each series they manufacture for use of solid fuels, giving rate of combustion and smokehood temperatures. What "one-number rating" do you assign to these boilers?

If a 12% CO_2 requirement was not met, please give the percentage you obtained in your output test.

Heating Engineers to Visit Canada in June

Under the leadership of M. Barry Watson, of the Ontario Chapter, the Committee on Arrangements is hard at work on plans for the semi-annual meeting of the American Society of Heating and Ventilating Engineers, to be held at Bigwin Inn, Lake of Bays, Ontario, Canada, June 26-28.

E. B. Sheffield, president of the Ontario Chapter, is compiling information on matters of transportation and reports that it is possible to reach Bigwin Inn by motor, rail or plane. It is proposed to run a special train from Toronto to Lake of Bays, Tuesday, June 25, arriving in time for dinner. Some of the chapters are planning to travel in special cars, which will be attached to the Bigwin Inn Special at Toronto.

For those who are motoring, detailed road directions are available from a local committee, as well as instructions regarding customs inspection and other necessary data. Motorists are asked to stop at Toronto and register at the Ontario Chapter's registration and information booth. If a sufficient number is registered, special convoys will be organized, which will proceed to Lake of Bays, under the direction of special traffic officers.

Accommodations at Bigwin Inn will be on the American plan at $7.50 per person per day. Plans for the meeting include technical sessions daily from 9:30 A.M. to 1:00 P.M. All business sessions will be held in the Pavilion located at the water's edge and connected with the east and west lodges by covered passageways. Delegates are urged to purchase round trip tickets as special excursion rates are in effect on both the Grand Trunk and Canadian National Railways, which run to Lake of Bays

Wide Range of Subjects Included in Program for Semi-Annual Meeting

Included in the tentative program for the meeting are the following papers and reports:

The Measurement of Air Velocity, by Prof. J. H. Parkin.

Overall Heating Efficiency of the Research Residence Warm-Air System Analyzed, by Prof. A. P. Kratz and J. F. Quereau.

Air Conditioning System of a Detroit Office Building, by H. L. Walton and L. L. Smith.

Report of Committee on Code for Testing and Rating Unit Heaters, by D. E. French, chairman.

Report of Committee on Interpretation of Code for Rating Low-Pressure Heating Boilers, by L. A. Harding, chairman.

Determining Dust Quantities in Air, by Prof. F. B. Rowley.

Capacity of Radiator Supply Branches for One and Two-Pipe Systems, by F. C. Houghten, M. E. O'Connell and Carl Gutberlet.

Pipe Sizes for Hot-Water Heating Systems, by Prof. F. E. Giesecke and E. C. Smith.

Report of Guide Publication Committee by S. R. Lewis, chairman.

Report of Committee on Code for Heating and Ventilating Garages, by E. K. Campbell, chairman.

Time Lag as a Factor in Heating Engineering Practice, by James Govan.

Overall Heat Transmission Coefficients as Determined by Test and by Calculation, by F. B. Rowley, A. B. Algren and J. L. Blackshaw.

Five Suggested Methods of Appraising Insulations, by Paul D. Close.

Report of Advisory Committee on Heating and Ventilating Exposition, by H. P. Gant, chairman.

Illinois Chapter Recommends Methods of Measuring Air Flow

So much interest was aroused at the March meeting of the Illinois Chapter on the subject of methods of measuring air flow through ducts, that the April meeting was devoted to this topic. Prof. L. E. Davies, of the mechanical engineering department of Armour Institute, was the principal speaker.

Mr. Davies based his remarks largely on the discussion by J. J. Aeberly, head of the Division of Ventilation of the Chicago Department of Health, of the proper way to measure air flow through registers. Mr. Aeberly had emphasized the fact that this item has assumed a special significance in Chicago because of the ordinance requirements. Due to trade practices in the ventilation industry, he said, a condition has resulted which in many instances does not require the engineer to determine the true performance of the ventilating system.

The Chicago Department of Health in establishing its present practice for testing ventilating equipment, as required by law, has adopted the standard of the American Society of Heating and Ventilating Engineers as outlined in the A.S.H. & V.E. *Guide* for 1929. In the adoption of this standard the department has recognized the limitations of such a method of test; that it is not necessary for a public health officer at all times to deal in absolute values as is sometimes done when more exact scientific practice is undertaken.

Summing up his discussion he expressed the opinion that when the engineer adopts the same procedure as prevails in the bridge design, namely, to provide for an adequate factor of safety, the test method will not take on the importance that it now appears to have. As an illustration, the factors of safety used in the bridge design were cited. A factor of approximately 4 to 5 is used when considering the designing strength of the material as compared with the actual strength of the elastic limit and as compared with the ultimate strength of the wrought-iron a greater factor was in use. Mr. Aeberly did not advocate the percentage of safety prevailing in the design of bridges but he did feel that a reasonable percentage of safety should be used.

At the outset of his address, Professor Davies stated that for a considerable time he had been conducting experiments for the Ventilating Contractors' Association of Chicago, in an effort "to determine the proper method for measuring air quantities delivered by a ventilating system to rooms occupied by human beings, the method to include measurements of air quantities at the register faces." He said that he considered the anemometer to be the only instrument suitable for general use so that the question narrows down to the use of this instrument and the interpretations of its readings.

In conducting his experiments at Armour Institute he passed the air through a fan, then through a duct of relatively small cross-sectional area and of sufficient length to permit insertion of Pitot tubes to secure accurate flow measurements; then into a larger duct where the velocity would approximate that through a grille. At the end of this duct the grille was mounted. Experiments were made by changing the final duct to an elbow and a branch type duct. Grilles also were changed to give results with different free-area types.

All grilles were marked off into small rectangular sections, and the anemometer held in the center of each space, experiments having shown this method to be more accurate than that of slowly moving the instrument over the face of the grille. Readings were first taken 3 in. away and then in contact with the grille, the latter method proving more accurate, and all final conclusions were based on this method.

His recommendation was that the anemometer should be held in contact with the grille, the area of which should be the sum of the gross area plus the net area divided by two, and the velocity should be the average velocity taken over the entire grille.

In the discussion following Mr. Davies's talk, Director F. C. Houghten of the A.S.H. & V.E. Research Laboratory, who was among the guests present, complimented the Ventilating Contractors' Association on the investigation, and said that the many inquiries received by the society and Research Laboratory fully indicated the importance of the problem.

Others participating in the discussion included Dr. E. B. Hill, H. M. Hart, and Messrs. Hart, Armspach, Heckel, Getschow and Haines.

Mr. Armspach made the point that any standards developed should be understood to apply to plain lattice-faced grilles. Dr. Hill thought that the Sheet Metal Contractors' Association had not been given sufficient credit for its work and he believed that this organization should be the one to complete the study. Mr. Heckel suggested that the subject be taken up at the summer meeting of the society, and he proposed that the report of Professor Davies be submitted to the society at that time for adoption, with any changes or additions that might be found necessary.

A. L. Weixel presented a resolution to the effect that the Illinois Chapter adopt as the correct method of measuring, by means of an anemometer, the quantity of air supplied through a grille, the following method, namely, that the anemometer shall be held in contact with the grille, the area shall be the sum of the gross area plus the net area, divided by two, and that the velocity shall be the average velocity taken over the entire grille.

Mr. Aeberly objected to this resolution as being too broad and he pointed out that the motion as made included ornamental plaster grilles. It is a known fact, he said, that an anemometer cannot be placed in contact with such a grille.

At the request of Mr. Sutcliffe the motion temporarily was withdrawn to permit further discussion of the report. At the same time he made the point that no consideration had been given to exhaust ducts.

Professor Davies said he used the "running-start" method of operating the anemometer, that readings 1 in. away differed only slightly from those made in contact with the register face, which possibly justifies the taking of readings 1 in. away in the case of oddly-shaped grilles. He felt that further experiments were all that were necessary to furnish answers to the other question raised.

Chapter Accepts Data Submitted by Professor Davies

After further discussion, Mr. Weixel again presented his resolution which, as before, was seconded by J. J. Haines. Mr. Aeberly then moved an amendment as follows:

"Moved, that the chapter accept the data presented by Professor Davies with a view to investigating the same and recommending its adoption by the A.S.H. & V.E. and that this matter be further referred to the standing committee appointed at the previous meeting for the purpose of conserving the interests of the society in the matter of this test, with instructions to that committee that they have power to act and call in the local groups interested in this problem with a view to adopting it as a practice in Chicago, pending such time as the national body adopts it or another standard."

A motion followed that the resolution of Mr. Weixel be considered without the addition of the clause providing for an investigation of Professor Davies's report. Mr. Getschow made an earnest plea for immediate action, at the same time commending the report. This led to the presentation of a motion by Samuel R. Lewis, which was seconded by

Mr. Aeberly and which, by common consent, was substituted for the resolution previously proposed. Mr. Lewis's motion, which was unanimously carried, was as follows:

"Resolved, that the Illinois Chapter of the A.S.H. & V.E. recommends that for measuring the air supply through a plain lattice grille with an anemometer, the following method be used: Multiply the average velocity of rectangles having between 6 in. and 10 in. sides over the surface of the grille, holding the anemometer in contact with the grille, by the area obtained by adding the net area of the grille to the gross area of the grille and dividing this sum by two. Further, that the Illinois Chapter recommends to the Research Laboratory that cooperative research be entered into as soon as possible with Armour Institute of Technology to continue this study."

Mr. Aeberly then proposed "that the chair instruct the standing committee that they take up this matter with interested groups with a view to having it adopted in the art locally." This motion carried.

At the preliminary business session, Ernest C. Prohaska and Hans J. Zack were elected to membership in the chapter. Ninety-four members and guests were present.

Western New York Chapter Discusses Pulverized Fuel

Recent developments in the burning of pulverized fuel were described by Hugo Hutzel, general manager of the Multicell Radiator Corporation, at the March meeting of the Western New York Chapter, held March 18, at the Buffalo Hotel in Buffalo. Mr. Hutzel, who is a past president of the chapter, said that for certain applications, powdered fuel was ideal for efficient and economical combustion. Its use, however, necessarily is limited to large projects, due to the cost of the essential equipment.

Powdered fuel, he added, burns like oil and gas, and the resultant ash is so fine that it cannot be discerned as it leaves the chimney. The combustion chamber must be at least 15 ft. in length because of the exceptionally long flame travel. If the flame impinges on the wall, it forms a slag, which is very difficult to remove.

There is a 20% depreciation on pulverizing machinery and the entire equipment must be replaced every five years. The pulverizing cost itself, runs from 75 cents to $2. per ton.

Previous to Mr. Hutzel's talk, President O. K. Dyer called on Roswell Farnham to outline the plans for the summer meeting of the society, which proved unusually interesting because, as he said, the meeting place, Lake of Bays, Ontario, is "within shootin' distance of Buffalo."

Michigan Chapter Gets Data on Fisher Building

A COMPREHENSIVE description of the mechanical features of the Fisher Building in Detroit was given to members of the Michigan Chapter at their April meeting, held in the new Fisher Building, April 16; 142 members and guests were served dinner in the dining room on the Concourse preceding the technical session.

Herbert Ziel, of Albert Kahn, Inc., who played a prominent part in the design of the ventilation of the Fisher Building, was the first speaker.

Mr. Ziel enumerated the different heating and ventilating systems used in the building and brought out the fact that although the equipment is scattered over the entire building, the control is centralized at one point. The building contains a bank, garage, theatre, private dining rooms, cafeteria, arcade, pedestrian tunnel connecting the Fisher Building with the General Motors Building, stores, rest rooms, X-ray departments, a wing devoted to the medical profession, broadcasting station, as well as office space, so that the ventilating engineers on the building had many interesting problems to solve.

After Mr. Ziel's address, G. D. Winans, of the Detroit Edison Company, recounted the problems which his organization had to meet in getting ready to furnish steam to the Fisher Building. As a matter of fact, the company is furnishing steam not only to the Fisher Building, but to the General Motors and Argonaut Buildings, which are grouped together, and his discussion covered the underground piping tunnel work.

One point which Mr. Winans brought out was the fact that the Fisher Building had found out by experience that when the turning on of the steam load in the various parts of the building was staggered, the cost of the steam demand was reduced over what it was when steam was turned on in all parts of the building at the same time.

Fred Johnson, of Johnson-Larsen & Company, heating and ventilating contractors, of Detroit, who had the heating contract on the Fisher Building, described the heating and ventilating systems, starting with the steam supply, as furnished by the Detroit Edison Company, and carrying it through the entire cycle.

Mr. Johnson brought out the fact that some 20 supply fans, 15 miles of pipe and 35 carloads of material were required for this building. 40 unit heaters were required for the garage alone, both of the floor-mounted and overhead type.

Mr. Johnson spoke of the method of returning the condensation to the boilers at the Detroit Edison Central Heating Plant and brought out a point which apparently is somewhat unique in that there is a float box in the return line, which allows the condensation to get back to the boilers in a constant trickle, rather than in slugs of water.

Among the unique features to be found in the heating and ventilation equipment are the copper radiators of the convection type throughout the building. No cast-iron radiation is installed. These radiators are equipped with direct-acting temperature-control valves. The zoning system of heating is used with control valves on the steam risers. Any or all parts of the building may be furnished with steam at will.

The Fisher Theatre, which is a part of this building and which has won the admiration of all who have seen it, has been treated as an individual unit. During the winter operating season, the air supply is through mushrooms in the floor and the exhaust is through the ceiling. For summer operation, however, the entire air flow is reversed, so that the cooled air is supplied at the ceiling and exhausted through mushrooms in the floor. This reversing of the air flow is accomplished by merely operating air switches.

All of the steam risers in this building are made up of welded pipes. There are no couplings or flanges, except where they are necessary from an operating standpoint.

Mr. Johnson brought out the fact that the piping erection gang followed the steel erectors when the building was being fabricated. A sleeve was placed around the piping at the different floor levels and then the floors were poured. After the sleeves were withdrawn, welding crews burned openings in the risers for the branch connections, etc.

Mr. Johnson summed up his talk by declaring that the most modern system of heating and ventilation is to be found in the Fisher Building.

After his address, William G. Boales presented to the assembly a motion picture, furnished by the Linde Air Products Company, which showed how pipe is welded on the job.

Later the entire assembly were guests of the Fisher Building and were taken to the machinery room in the sub-basement where an inspection was made of the equipment.

During the business session, President Rowe announced the appointment of a nominating committee consisting of Edward Harrigan, chairman; James E. Degan and Ray S. M. Wilde, to select candidates for next year's chapter officers.

Preliminary List of Exhibitors at International Heating and Ventilating Exposition

MANUFACTURERS of equipment used in the heating and ventilating industry and publishers who have reserved space in the forthcoming International Heating and Ventilating Exposition to be held in the Commercial Museum, Philadelphia, January 27-31, 1930, simultaneously with the annual meeting of the A.S.H. & V.E., include the following:

Air Control Corp. of New York
American Gas Association
American Gas Products Corp.
American Radiator Co.
Ames Pump Co.
Armstrong Machine Works
Barnes & Jones
Bishop & Babcock Sales Co.
Bryan Steam Corp.
Bryant Heater & Mfg. Co.
Carrier Engineering Corp.
Chicago Pump Co.
Cochrane Corp.
Cooling & Air Conditioning Corp.
Copper Radiator Sales Corp.
Coppus Engineering Corp.
Crane Co.
Direct Control Valve Co.
Domestic Engineering Publications
Domestic Stoker Co.
Dunham C. A. Co.
Farnsworth Co.
Frank Heater & Engr. Co., O. E.
General Gas Light Co.
Grinnell Co., Inc.
Hardinge Bros., Inc.
Hart & Hutchinson Co.
Hartzell Propeller Co.
Heating Journals, Inc.
Heating and Ventilating Magazine
Hill Co., E. Vernon
Hoffman Specialty Co., Inc.
Illinois Engineering Co.
Iona Ventilator Co., Inc.
Johnson Service Co.
Kelly Brass Works
Kewanee Boiler Corp.
Kieley & Mueller, Inc.
Korfund Co., Inc.
Leslie Co.
Marsh & Co., Jas. P.
McDonnell & Miller
McQuay Radiator Corp.
Mears-Kane-Ofeldt, Inc.
Mercoid Corp.
Minneapolis-Honeywell Regulator Co.
Modine Mfg. Co.
Molby Boiler Co.
Multicell Radiator Co.
Nash Engineering Co.
National Regulator Co.
Nesbitt, Inc., John J.
Richmond Radiator Co.
Rome Brass Radiator Corp.
Sarco Co., Inc.
Star Expansion Bolt Co.
Strandwitz & Scott, Inc.
Taco Heaters, Inc.
Time-O-Stat Controls Co.
United States Radiator Corp.
Vinco Co., Inc.
Webster & Co., Warren
Westinghouse Electric Mfg. Co.
Wood Conversion Co.
Wright-Austin Co.
York Heating & Ventilating Corp.

The Commercial Museum, Philadelphia, is one of the group of buildings located just west of the Pennsylvania Railroad right of way, and south of the railroad station in that city. It adjoins the University of Pennsylvania grounds and easily is accessible.

Inquiries concerning the exposition should be addressed to International Heating and Ventilating Exposition, Charles F. Roth, manager, Grand Central Palace, New York.

Western New York Chapter Discusses Temperature and Humidity Control

What was described by the 65 members and guests present as one of the most successful and interesting meetings of the Western New York Chapter, was held at the Elks Club, Buffalo, April 15. M. F. Rather, manager of the Cleveland branch of the Johnson Service Company, talked on "Modern Applications of Automatic Temperature Regulation and Humidity Control." Mr. Rather illustrated his talk with stereopticon slides, which included a number of charts showing savings in steam consumption due to automatic heat control.

Temperature regulation, said Mr. Rather, is divided into three sub-divisions from the standpoint of method. They are the pneumatic, or air-operating system; the electric, with standard voltage of 110 or 120 as motivating power, or the usual type, using approximately 15 volts and about 1 ampere at the instant of contact, and the self-contained thermostat, which generates power by the expansion and contraction of enclosed liquid or gas.

A later development, as described by Mr. Rather, is in the form of a "super-sensitive" thermostat. The use of convection type or copper heaters makes essential a thermostat graduated to apply a definite pressure of air on the branch line to the valve or damper. This thermostat is adapted especially to unit ventilators but is equally efficient on other types of radiation.

Slides were shown illustrating the correct use of thermostats in connection with steam-blast systems, warm-air furnace systems, combination split systems, and unit systems. Under this heading was shown a "pilot" thermostat designed to be placed in a theatre or auditorium, permitting the full effect of the blast system to be used until such time as the room reaches the proper temperature when the multiple thermostats mounted in the ducts come to play, admitting heat from the various sections of the heater, as needed.

Other slides illustrated the method of control used in connection with different types of unit ventilators, each machine presenting a different problem of regulation. As Mr. Rather said, the common method of automatic regulation on unit heaters contemplates the use of intermediate thermostat control on the mixing dampers, and control of the auxiliary direct radiation. Tests and experiments were presented to illustrate the need of diaphragm control on the unit radiator itself to avoid overheating at certain times. Control of unit ventilation, he stated, means a study of air diffusion and physical characteristics of the rooms to obtain the utmost efficiency.

Mr. Rather described at length the "Dual" system, whereby whole sections of buildings or individual rooms can be segregated with respect to temperature control and have temperatures either lower or higher than those in the other portions of the building.

New methods of installing temperature regulation piping in office buildings was illustrated to show the ease with which an office can be sub-divided into smaller rooms, or vice versa, simply by picking up the air piping from a wall box installed on each mullion and each column. In this way, it is possible to solve the problem of isolating one or more radiators from the thermostat, when partitions are built.

Among the humidity control appliances illustrated was the "Grid" or wrapped steam coil humidifier and the copper pan humidifier, consisting of pipes immersed in water, with a copper float for maintaining the proper water level located outside the duct or fan chamber.

In the preliminary session, President O. K. Dyer announced the appointment of Cecil Farrar as the head of the committee to foster interest in the forthcoming meeting of the A.S.H. & V.E., at Bigwin Inn, Ontario.

New York Chapter

At the April meeting of the New York Chapter, held at the plant of the Carrier Engineering Corp., Newark, N. J., April 15, officers for the coming year were elected as follows: President, E. J. Ritchie; vice-president, A. J. Offner; treasurer, F. E. W. Beebe; secretary, E. B. Johnson. H. B. Hedges, R. Donnelly and Dr. C. W. Brabbée were elected to the board of governors. Members of the chapter numbered 239 at the beginning of the year. There were 13 new members admitted and 13 resignations accepted during the year, so that the number of members remains 239.

An inspection of the Carrier plant, during which chapter members had an

opportunity of observing the processes of manufacture of Aerofin and the testing of the Weathermaker, preceded the dinner at which members were the guests of the Carrier company. Of particular interest was the unusually fine ventilation of the plant, especially noticeable during the dinner when the guests were smoking. Unit air-conditioners kept the room clear of smoke and hot, foul air.

Following the dinner, J. I. Lyle described, with the aid of slides, the ventilation of the Capitol at Washington, and told how the designers of the ventilating system cooperated with the chief surgeon of the United States, the government architects and other members of the committee in charge. This installation is a notable one, especially since the space available for the blowers and ducts was exceedingly cramped. The ducts were so installed over the chambers that at no time are shadows thrown on the skylight.

Doctor Adler, who represented the chapter at Albany last month, reported that the bill for the licensing of master steamfitters and the approval of all piping plans by a state commissioner, stands but little chance of being passed.

Mr. Lyle mentioned another bill which is to be brought before the state legislature which will prohibit recirculation of air in all auditoriums, exclusive of New York City and Buffalo. A committee will be appointed to study the bill and render a report at the May meeting of the chapter.

Plans for May Meeting of Western New York Chapter

At the forthcoming May meeting of the Western New York Chapter, in Buffalo, May 13, the guests will include the graduating class in engineering at the University of Kentucky. Dean F. Paul Anderson will accompany the class and will be the guest speaker of the evening. The Council of the society has arranged to hold its May meeting in Buffalo, just previous to the meeting of the Western New York Chapter, so that the council members also will be present.

Wisconsin Chapter

Boilers, smoke breechings and chimneys, as well as formulae for figuring draft, factors affecting chimney draft, and draft requirements for different fuels, was the subject of a talk given by C. E. Bronson, of Kewanee, Ill., at the monthly meeting of the Wisconsin Chapter, March 18.

Many members of the Heating and Piping Contractors Milwaukee Association responded to an invitation extended to them to be present.

St. Louis Chapter Pays Tribute to Edwin S. Hallett

A tribute to the late E. S. Hallett, chief engineer of the St. Louis Board of Education, who died March 29, was paid by the St. Louis Chapter at its April meeting held at the Roosevelt Hotel, April 3, in the form of a memorial suitably embossed. A copy of this memorial will be sent to the headquarters of the society in New York.

H. Gary Fitzgerald addressed the chapter on the subject of "Fooling the Public." T. J. Hester was made chairman of a committee to stimulate interest in the forthcoming summer meeting of the society at Lake of Bays, Ontario, Canada, the last of June. The chapter held its spring dinner dance at the Westborough Country Club, April 9.

At the March meeting of the chapter, R. E. Chappel, of the St. Louis County Gas Company, spoke on gas heating. He stated that there are approximately 900 installations of gas-fired boilers in residences in St. Louis and St. Louis county.

Welding Torch May Replace Pipe Wrench

That the use of welded pipe lines may become so general that the pipe wrench will become obsolete, was the statement made by Prof. S. E. Dibble, of the Carnegie Institute of Technology, in his paper "Welding in the Heating and Ventilating Industries," read before the annual meeting of the American Welding Society in New York, April 25.

Professor Dibble said that welding had been taught at the Carnegie Institute of Technology since 1917, and since that time the use of welding in the heating and plumbing industries has become widespread. He pointed out that it is easier to train steamfitters and plumbers in the use of welding equipment than it is to take trained welders and teach them the intricacies of steamfitting and plumbing, and urged that an effort should be made to teach apprentices the use of welding appliances and not confine such instruction to skilled workmen.

Although steamfitters have become proficient in the manipulation of welding and cutting tools, they are not trained to see new applications of welding to their trade. Consequently, welding engineers and manufacturers of welding equipment were urged to investigate the possibilities and advantages of welding for new purposes in the heating, ventilating and plumbing industries, so that artisans will be enabled to use welding equipment to even greater advantage than is possible at present.

One of the great advantages of welded heating lines is that friction losses are reduced. This is particularly advantageous in water heating systems where the motive power is so small. Professor Dibble quoted from "Heating and Ventilation," by Reichtel and Brabbée, in which the coefficient of resistance of a 90° elbow in a screwed-joint line is given as 1.0, whereas when using a bended pipe, in which the radius of bend equals five times the diameter of the pipe, the coefficient is 0.

The use of such bends, made of pipe butt-welded to the mains will decrease resistance by eliminating eddies which are present in screwed fittings. These eddies are unavoidable with screwed fittings due to the fact that the diameters of the fitting and connected pipe are not equal. Branches and tees can be taken off by running the main off as a branch and cutting a hole in the side and welding the extension on.

Reductions in size of lines using screwed fittings cause frictional losses due to the abrupt change of diameter, and this can be avoided by using tapered reductions welded in the lines. A further advantage of all such connections is that it is unnecessary for the contractor to carry a large stock of fittings.

Professor Dibble concluded his paper with a suggestion that valuable data might be obtained if two water heating system test plants be erected, identical except that the one would consist of screwed fittings throughout and the other of welded joints, so that the improved circulation, due to the lower frictional losses in the latter, could be shown.

A Study of Body Radiation

In a report entitled "A Preliminary Note on Radiant Body Heat and the School Ventilation Problem," T. J. Duffield, executive secretary of the New York Commission on Ventilation, stated that the amount of body heat loss by radiation and the thermal gradients for pupils of different average ages must be investigated before standards of floor space in classroom designs can be established scientifically and logically.

For the purpose of carrying on such experiments the New York Commission on Ventilation, in June, 1927, made a grant of $1000 to the Smithsonian Institution. A report of these experiments has been issued, entitled, "A Study of Body Radiation," by L. D. Aldrich, who was in charge of the work.

An instrument for the measurement of radiation called a melikeron, designed by the Smithsonian Astrophysical Observatory in 1920, was used in these tests. This instrument essentially is different from the ordinary type of radia-

tion instrument such as the pyranometer, pyrgeometer, bolometer, etc., in that radiation is absorbed not upon a flat surface but by a device shaped like a honeycomb. This makes the instrument, by virtue of its form, approximately a "black body," capable of absorbing practically all radiation directed upon it.

It was found that at normal indoor temperatures in still air and with the subject normally clothed and at rest, the major heat losses from the human body are distributed as follows: loss of evaporation of water from lungs and skin, 24% of the total; radiation loss, 46% of the total, and conduction loss, 30% of the total. Among the concrete results of the experiment was the determination that the radiation from the skin and clothing is approximately that of a "black body" or perfect radiator. It was further found that skin temperatures computed from melikeron radiation measurements are about 1° C. higher than skin temperatures measured with a thermoelement. Apparently the melikeron "sees" deeper into the pores of the skin.

Roughly speaking, the convection loss from the human body is one third less than the radiation loss in still air and normal room temperatures. However, normal fluctuation in humidity indoors produces negligible effect upon radiation loss.

The work of many investigators agrees in placing the basal metabolism per square meter of body surface of adults considerably lower than that of children, yet the radiation losses in the tables presented in this book show no such change as between adults and children. The ratios of radiation loss divided by basal metabolism in each case are higher for adults than children. As the author states, this is difficult to explain. Published by the Smithsonian Institution, size 6½ in. x 9¾ in. Pp. 54.

Bryant Gas-Heating Sales School

Forty-eight men representing 39 gas companies attended the third Bryant gas heating sales school, Cleveland, O., March March 5-14. Fifteen states as well as Canada were represented.

The entire course was given by the executives of the company and the lectures covered the production, sale, installation and operation of gas-fired house-heating equipment with special reference to sales methods and plans.

Problems covering each day's lectures were handed out every evening at the close of the last session, and the solutions handed in at the beginning of the following morning's session, corrected during the day and discussed the same afternoon during a discussion period. A notable feature of the convention was that there were no absentees. Among the subjects covered were: boiler and furnace erection; trim assembly and adjustments; combustion of gas; methods of testing; boilers, furnaces and controls; steam heating systems; water and warm-air heating systems; servicing; calculation of heat losses and numerous lectures on sales problems and advertising.

Fiftieth Anniversary of the A. S. M. E.

A congress of engineers will be held in April, 1930, to celebrate the fiftieth anniversary of the founding of the American Society of Mechanical Engineers. This organization held its first meeting fifty years ago in the editorial office of the *American Machinist* and its first organized meeting in the administration building of the Stevens Institute of Technology in Hoboken.

The program as projected for the celebration, which will be held in both New York and Washington, will include recognition of the place and purpose of the industrial and technical press today in the promotion of engineering.

Plumbing and Heating Institute Held in Washington

The adoption of better business methods was urged upon the heating and plumbing contractors who attended the first annual Potomac States Plumbing and Heating Institute, held April 1-3 at Washington, D. C.

Delegates were welcomed by L. Harris, municipal architect of the District of Columbia, who acted as the sponsor and who was introduced by A. R. McDonegal, chairman of the committee. President Marvin, of George Washington University, welcomed the visitors and predicted a bright future for the closer affiliation between the contractors and the universities. Phillip T. Dodd, of the Department of Commerce, addressed the assembly on the subject "Changing Aspects of the Plumbing and Heating Business."

"Certified Heating and Gold Bond Plumbing" was the subject of a talk by Joseph C. Fitts, of the Heating and Piping Contractors National Association. Maurice J. Colbert, who acted as chairman of the second session, introduced Arthur H. Senner, of the Department of Agriculture, who spoke on "Intermittent vs. Continuous Firing: Oil and Gas." This talk was accompanied by blackboard demonstration of technical problems.

Prof. S. E. Dibble, of Carnegie Institute of Technology, spoke on the subject of "Estimating for the Plumbing and Heating Contractor," and stressed the importance of detailed records of all material installed for each job. Professor Dibble urged that his hearers take a course in bookkeeping.

Dr. M. S. Van Deuzen, of the heat division of the Bureau of Standards, gave a technical talk on "Physics of Heating: Heat Transmission, Flues and Radiator Ratings." An extended discussion was held after this paper was delivered. A plea for closer relations between contractors and their banks was made by Raymond L. Schreiner, president of the Bank of Brightwood, who spoke on the subject of "Banking for the Plumbing and Heating Contractors."

George H. Wilson, of the Plumbing and Heating Industries Bureau, stated that too much of the heating contractors' time was devoted to the mechanical and not enough to the commercial side of his business. He further said that every contractor should know his costs accurately and avoid striving for volume until he does.

Several speakers were present from various governmental departments and also from the Plumbing and Heating Industries Bureau.

Representatives from 39 Gas Companies at the Third Bryant Gas-Heating Sales School, Cleveland, March 5-14

Heating and Piping Contractors National Association

St. Louis Heating Contractors Planning to Entertain National Association

Under the leadership of Larry De Neille, the St. Louis Association is planning an interesting entertainment program in connection with the forthcoming annual convention of the Heating and Piping Contractors National Association at the new Jefferson Hotel in St. Louis, June 10-13.

Among the delegations will be one from California, where Field Representative E. G. Byrd reports unusual interest in association activities on the part of the local contractors. Certified heating, he reports, is firmly established in the San Francisco and Oakland territories, while Seattle and Portland are planning certified heating programs.

Heating Contractors Adopt New Factors on Infiltration

New factors covering infiltration through building materials have been adopted by the Committee on Standardization and ordered printed in the association's Engineering Standards. The figures given are for each lineal foot of crack for a period of one hour.

WINDOWS:

Residential casements—wood, 100 cu. ft.

Residential casements—steel, 50 cu. ft.

Rolled Section Steel Windows, 100 cu. ft. per ft. of perimeter of ventilating sash.

OUTSIDE DOORS:

Residences, 100 cu. ft.

Residences, with metal weather strip, 50 cu. ft.

Residences, with storm doors, 50 cu. ft.

Residences, with inner vestibule doors, 50 cu. ft.

Stores, etc., 200 cu. ft.

The committee also has approved the "Recommendations for Standards for Domestic and Industrial Fuel Oils," as drafted by the Department of Commerce.

Complaints that valves and traps in some cases have not been made up to a standard dimension, although the valves themselves conform to the standard roughing-in dimensions, has led the committee to amend its standards by adding the requirement that:

"Connecting ends should be threaded and gauged as to threading according to the American (Taper) Pipe Thread Standard, ASA No. B-2-1919."

Approval was given by the committee to the "Standard for Pipe Plugs and Standards for Steel Base Fittings," submitted by the Manufacturers Standardization Society of the Valves and Fittings Industry and to "Standards for Welding Neck Flanges," as proposed by the association's Sub-Committee on Welding.

Directors Hold Three-Day Session

Seven members of the board of directors of the Heating and Piping Contractors National Association recently spent three days in New York discussing important association problems. All of the recommendations of the committee on standardization, of which Ralph S. Franklin is chairman, were adopted. John H. Zink, chairman of the sub-committee on welding, read the report of his committee. This report was approved.

Joseph C. Fitts reported on the work of the Association for Correlating Thermal Research. Mr. Fitts told the board of the useful work this organization has done in preparing bibliographies for the technical committee of the Heating and Piping Contractors National Association. E. W. Verity, chairman of the membership committee, reported that 29 new members had been added to the association since the last board meeting.

E. G. Byrd, field representative, who recently returned from a trip through the West, stated that heating and piping contractors in Texas are showing great interest in the certified heating movement, and are working on the organization of their local associations to put the program into effect. Mr. Byrd said that certified heating is firmly established in the San Francisco and Oakland territories, and that the Seattle and Portland associations are at work on well-planned programs.

Boston Association Elects Officers

The Heating and Piping Contractors Boston Association held its annual meeting March 22, at which the following officers were elected: President, Thomas O'Callaghan, Acme Heating and Ventilating Company; vice-president, E. A. Dusossoit, Lynch & Woodward, Inc.; treasurer (reelected) Peter J. McMurrer, McMurrer Company; clerk, F. C. Scofield, Scofield-Campbell Company. Board of directors consists of the officers and William W. Underhill, Joseph F. Dwyer, Frank W. Howard and M. E. Chase, former president.

Committees appointed were: standards committee, R. S. Franklin, L. R. Stetson and E. C. Whitaker; examining board: Edgar Shaw, F. W. Zemeir and E. S. Stubbs; audit committee: F. C. Scofield, T. A. Ridder and William T. Smallman; trades relations: F. A. Merrill, F. S. Cleghorn and Herbert A. Snow; legislative committee: E. R. Stone, R. A. La Centra and E. A. Dusossoit; nominating committee: F. A. Merrill, H. A. Snow and I. D. McLean; welfare committee: H. E. Barber, J. F. Dwyer and Edgar Shaw, with Peter J. McMurrer and W. S. Cousens as alternates.

How Rapidly Heating Apparatus Depreciates

Suggestions for figuring rates of depreciation of heating apparatus have been compiled by a Sub-Committee on Depreciation of the Heating and Piping Contractors National Association. In the case of fireproof buildings, the recommended rate is 2%; fire-resistant buildings, 3%; frame buildings, 4%; pipe sheds, 16%; sprinkler, heating and lighting equipment, 5%; shop fixtures, 10%. For fixed machinery, including threading machines, the rate of depreciation is 10%. Movable large tools depreciate at the rate of 33 1/3% per year; kit tools, 100%.

Office fixtures, such as safes, typewriters and calculating machines, depreciate at the rate of 20%; furniture and fixtures at the rate of 6 2/3%. For automotive equipment the depreciation of light machines is 33 1/3%; medium, 25%; heavy, 20%.

Efforts are being made by the association to have the United States Government accept these rates as a basis in making out income tax returns.

Six-Weeks' Course in Welding to Be Given at Pittsburgh

Announcement has been made that a six-weeks' course in oxy-acetylene welding and plumbing will be given from June 28—August 9, at the twelfth summer session of the Carnegie Institute of Technology, Pittsburgh.

Although these courses are designed primarily for the benefit of teachers and supervisors, the work is outlined to have a special appeal to undergraduates and artisans who feel a need for more technical training along these lines.

Over 2500 Delegates Attend Oil-Burner Convention

Sixth Annual Convention of the American Oil Burner Association, Largest Yet Held, Attracts Representatives of Industry from United States and Canada

E. M. Fleischmann, Newly-Elected President of American Oil Burner Association

EXHIBITS of sixty manufacturers of oil burners and accessories, the high quality of the papers read and addresses delivered at the sessions, and the attendance of over 2500 dealers, engineers, manufacturers and salesmen, combined to make a notable success of the sixth annual convention of the American Oil Burner Association, held at the Hotel Pennsylvania, New York, April 9-11.

The convention was formally called to order Tuesday afternoon, April 9, when President J. C. Johnson welcomed the delegates and spoke of the strides the association has made during the past year. W. R. Boyd, Jr., executive vice-president of the American Petroleum Institute, was then introduced and spoke on the subject "The Oil Industry's View of Oil Heating." Mr. Boyd urged his audience to remember that cooperation must exist between all of the allied industries if oil heating is to continue being successful.

Louis Wiley, general manager of the *New York Times*, spoke on the value of publicity. Alfred Reeves, general manager of the National Automobile Chamber of Commerce, followed with an address on "The Value of Industrial Cooperation." Mr. Reeves advised standardization of parts and interchange of ideas between manufacturers. He said that in the automobile industry the manufacturers had a system of cross-licensing whereby the manufacturers pooled their individual patents and received licenses to other patents. Results have been so satisfactory that not a lawsuit has been filed in the fourteen years the system has been in existence. The speaker suggested that his organization would be glad to have its legal advisers cooperate with a committee of the association and give it the benefit of past experience.

George Oxley, director of public relations of the National Electric Light Association, told the session that the electrical industry is nearing a saturation point. He outlined the recent survey of the oil-burner industry made by the N.E.L.A. and said that his organization is greatly interested in the development of the load built up by oil burners.

"The need for intensive research in the oil-burner industry or in any other for that matter, is apparent when the experience of America's major industries is reviewed," was the statement made by Thornton Lewis, president of the American Society of Heating and Ventilating Engineers, who addressed the convention on the subject of research. Standards for equipment, he said, should be raised and the fundamentals carefully studied in order that oil burners maintain their prestige in the heating field.

Mr. Lewis was followed by A. R. Small, vice-president of the Underwriters' Laboratories, who told of the work his organization is doing for the industry and discussed the subjects in which the laboratories and the manufacturers are not in accord.

At a meeting of the board of directors of the association held Tuesday afternoon, E. M. Fleischmann, president of the May Oil Burner Corporation, was elected president of the association for the coming year. Mr. Fleischmann has long been a leading figure in the industry and has been responsible for many constructive movements initiated by that organization.

E. P. Bailey was re-elected chairman of the board of directors, and the following vice-presidents were selected: Walter F. Tant, W. C. McTarnahan, George Bullock, I. M. Nelson, and J. W. Scott.

At a meeting of the board of directors of the Oil Heating Institute held Wednesday morning, Haldeman Finnie, vice-president and general manager of the Timken-Detroit Company, was elected president of the Institute. Lionel Jacobs was chosen as vice-president, Trell W. Yocum as managing director and E. E. Newsom as secretary. The directors elected were: Walter F. Tant, Haldeman Finnie, J. C. Johnson, A. E. MacInnis, W. C. McTarnahan, E. M. Fleischmann, and Lionel Jacobs.

Engineering Session

At the engineering session, held Wednesday morning, H. S. Rogers, vice-president of the Combustion Fuel Oil Burner Company, acted as chairman. Mr. Rogers introduced Elliott Harrington, industrial engineer of the General Electric Company, who, in a talk on "The Application of Electricity to the Domestic Oil Burner," made some suggestions for the consideration of engineers and manufacturers who are concerned with the design of electrical controls. He recommended the use of a heater element rather than a spark gap for ignition as this would do away with the 1½-min. starting period. The large amount of heat stored in water systems causes the thermostat to "overshoot," and the application of a heat load thermostat, such as is used in heat-treating furnaces, was mentioned by the speaker as a possible solution of this difficulty. In this device the small heater element is energized some time before the thermostat calls for a change of operation. An electric clock might give better results than the manually-wound spring clock at present used on thermostats.

Mr. Harrington said that there might be a possibility of the adaptation of the photo-electric cell in electrical control design. This cell is operated by a change in the amount of light reflected on it, and it might be used in place of the present controls which operate when there is no heat forthcoming after the thermostat calls for heat. The photo-electric cell would operate the instant the flame from the burner changed the amount of light in the chamber.

The speaker went on to say that the capacitance motor might have some applications in the oil-burner industry. This motor is so designed that capacitance rather than reactance is used to split the phase and a 90% power factor is obtained. It is totally enclosed, has no slip rings, operates quietly, and has a low starting torque.

Average Chimney Too Large for Natural-Draft Burner Installation

"Relation Between Draft and Burner Operation" was the subject of a paper by J. L. Breese, Jr., president of the Breese Engineering Corporation. The need for some device to regulate the draft in natural draft oil-burner installations is evidenced by the fact that chimneys are from 25% to 50% larger in area than is necessary for oil-burning requirements, and the height of the chimney is dependent upon the architecture of the house rather than upon the necessities of the installation. In order to show the variation in stack draft, Mr. Breese made some tests on a 40-ft. chimney. With breeching temperatures of 300°, the draft, in inches of water, was 0.86 in 0° weather, 0.45 in 30° weather and 0.21 when the outside temperature was 50°. The outside temperature, barometric pressure, area of stack, height of stack—all are variables which must be controlled to keep the draft constant, necessary since the supply of oil to the burner is constant. The conclusions were that all natural draft burners should have draft control, but that no blower-type burner should be so equipped.

Haldeman Finnie, New President of Oil Heating Institute

F. I. Raymond, president of the F. I. Raymond Company, read a paper on "Controlling Oil Burners Automatically by Outdoor Temperatures."

Oil-burning boilers designed exclusively to burn liquid fuel are becoming more and more popular in the industry. Henry D wns, eastern sales manager of the Combination Boiler Company, presented a timely paper on the "Design of Oil-Burning Boilers." Mr. Downs stated that to insure perfect combustion a definite volume of firebox is required. Some burners perform better in long, narrow fireboxes while others give better results in round boxes. For burning oil, a boiler should have plenty of primary heating surface.

Heat transfer varies as the fourth power of the temperature difference between the fluid and the flame, so that all sides of the firebox should be water-backed. The disengagement area should be in proportion to the water content of the boiler and should be, as nearly as possible, equal to the horizontal area of the boiler itself. Ample steam space should be provided.

It was stated that heating surface is valuable only when present in correct relation to the firebox volume, steam space, and disengagement area. The boiler should be so rated that the manufacturer can guarantee it, and the speaker then compared the conditions in the cast-iron boiler industry, where over-rated boilers, he said, are the rule rather than the exception, with the oil-burning boiler industry, where the manufacturers are rating their boilers at guaranteed outputs.

Mr. Downs emphasized the point that the manufacturers of specially-designed oil-burning boilers are trying to work in harmony with the manufacturers of oil burners, and are not trying to force oil-burner makers to meet their specifications.

The bricking of the boiler depends altogether on the type of burner used. So far as the fuel used is concerned, this is dependent on the burner installed in the boiler. Combustion space should vary in direct proportion to the amount of fuel burned, and 2 to 3 cu. ft. of space should be supplied for the combustion of each gallon of oil burned per hour.

Long flue travel is necessary in such boilers, and short circuiting should be eliminated. The velocity of the flue gases should be high; this can be done by using flues having small areas. There are two groups of design in the oil-burning boiler design, one consisting of tubes nested closely together and the other using a system of baffling to force the hot gases against the water tubes.

Cleaning doors should be symmetrically arranged so as to balance circulation, and they should be large enough to make cleaning easy.

Sales Session

W. A. Kemp, director of sales for Hardinge Bros., Inc., who was chairman of this session, introduced M. E. Simpson, vice-president of Electrol, Inc. of Missouri, who outlined the possibilities for automatic heat in 1929. Mr. Simpson said that the endorsement of oil heat by the American Petroleum Institute and the National Electric Light Association has and will contribute to the increased use of oil as domestic fuel. He further stated that on April 1 of this year his company had four times as many orders on its dealers' books as it had at the same time last year.

"Retail Sales" was the subject of a talk by T. C. Kyle, sales manager of the Winslow Boiler and Engineering Company. Mr. Kyle believes that one of the reasons for the increase in the use of oil for house-heating is that where five years ago salesmen were selling the mechanical features of their burners they are now selling their prospects on automatic heating and the consequent advantages arising therefrom.

E. V. Walsh, sales manager for the Timken-Detroit Company, presented a paper on the "Value of Analysis." Mr.

Walsh stressed a fact that also was brought out in the manufacturer's session held simultaneously with the sales session, that an analysis of salesmen's reports showed that seasonal variations in manufacturer's sales have partly been due to decreased efforts in supposedly dull periods.

In their lively presentation of their subject, "This Business of Selling," Professors Borden and Busse, of New York University, condensed the results of their work in sales research to six basic principles of sales presentation. These are: (1) Don't talk too much; (2) Don't interrupt when the prospect is talking; (3) Don't get belligerent or overpositive; (4) Always inquire what the prospect's objections are before attacking them; (5) After a prospect raises an objection, restate it in your own words so that there is no misunderstanding; (6) Use only one issue as your basic attack as the conclusion of the interview.

Manufacturers' Session

Haldeman Finnie, vice-president of the Timken-Detroit Company, chairman of this session, after a short address, introduced Howard W. Dickinson who spoke on "Selecting Space and Copy to Meet Your Advertising Needs." Mr. Dickinson urged manufacturers not to fail to back up the advertising and sales managers in their appeals to the public, and said that there is a tendency toward romanticism in everyone which is the controlling motive in his doings, and an appeal to this tendency is the strongest selling force it is possible to use. He stated emphatically that the public was more ready for the oil burner than it is willing to admit or than research would indicate.

Lawrence Smith, general sales manager of the Petroleum Heat and Power Company, capably covered the subject "How to Market Oil Burners." Mr. Smith said that 75% of advertising and sales appropriations should be spent on the consumer, and the remainder on the dealers, salesmen, commissions, house organs and conventions. Money must not only be spent in finding people to buy but also in building up a sound sales structure. If all of the appropriation is spent on the building up of the sales force, sales resistance will be high. If too much is spent on building up a demand by direct appeals to the prospect through advertising, the sales force will be too weak to keep pace with the inquiries.

Rotogravure advertising by Petroleum Heat and Power in metropolitan newspapers has not only been unusually successful but has brought in inquiries at a lower unit cost than was believed possible.

That 97% of all business is done on a time-payment basis in one form or another was brought out in a talk by C. Y. Palitz, president of the Credit Alliance Corporation. A city having diversified industries represents a better credit risk than those communities in which the population is engaged in one or two industries. This company has found that a customer who has a burner which is well serviced will meet his payments promptly, while others do not have the same willingness to pay.

Mr. Palitz suggested that any manufacturer who sells on a time-payment basis should set aside a certain amount from the sale of burners so sold to take care of servicing, which might be necessary in cases where the dealer goes out of business.

I. Lubbock, chief engineer, fuel oil department, Shell-Mex, Ltd., London, reported that the same difficulties in oil-burner design, sales and servicing, are being experienced in England as have arisen here. The most significant statement made by this speaker was that in England the oil companies actively promote and aid the sale of oil burners in order to create a demand for oil and furthermore actually aid in the servicing of burners.

The reason for the small development of domestic oil burning in Great Britain is that the climate is mild and the national temperament is such that automatic heat does not have the appeal that it does in this country.

Mr. Lubbock strongly urged that the recommendations for fuel oil standards, which are now in the hands of the Department of Commerce, be widened so as to make it easier for refiners to meet the specifications.

That warm-air heating has advanced more in the last two years than steam and water heating was the statement made by L. Wayne Arny, advertising and publicity manager of the Richardson and Boynton Company. Inasmuch as Mr. Arny's company is engaged in the manufacture of all types of boilers and furnaces, his remarks deserve careful thought.

W. P. Mackenzie, president of the W. P. Mackenzie Company of Philadelphia, suggested to manufacturers that they do everything in their power to aid the dealers in developing cost systems and so arranging their businesses that they can tell whether they are making a profit or losing money.

Dealers' Session

L. A. Welch, general sales manager of the Silent Automatic Corporation, was introduced by the chairman, Charles Bendix, president of the Oil Heating Association of Long Island. In his paper, "The Problem of Seasonal Sales," he said that the biggest problem of the dealer is to overcome the sharp decline in sales during certain times of the year. The desire to buy is not simultaneous with the determination to buy. The first part of the year should be devoted to laying the foundation for future sales. The public must be educated to realize that oil heat is a convenience as well as a comfort maker. With persistence, the first three months of the year can be made the most productive if the dealer will remember that the prospective purchaser is shovelling coal, and that his coal supply is decreasing every day.

Mr. Welch left four thoughts in the dealers' minds—he must have a sound plan that is attractive and inviting to the prospect; he must do more consistent advertising; he must put forth more consistent and intelligent sales efforts, and he must present his proposition to more people.

J. S. Kaplan, vice-president of Preferred Utilities Company, explained how failures and successes were made of dealers by their own organization. In his paper, "Dealer Organization," Mr. Kaplan said the most important things to check up on are dealers' financial resources, their sales department, and their installation and service department. Mr. Kaplan showed some of the things that happened to dealers who had not a sound organization, and offered suggestions that should aid them materially in building up business.

H. B. Lewis, vice-president of the Commercial Credit Corporation, spoke on "The Advantages of Time Payment." He explained what installment payments are, how safe the system is, its salability, and how it affects the dealer's business.

L. D. Angell, of the Electrol Distributing Corporation told how essential accounting is to the oil-burner dealer. By studying his profit and loss statement each month the dealer can know just what expenses have to be cut down and which can be continued. Mr. Angell stated that a profit and loss statement is worth far more than a cost statement.

Advertising Session

An advertising session, held during the morning of the closing day of the convention, April 11, was primarily of interest to advertising and sales executives associated with manufacturers. The program included papers and talks by men who stand high in the advertising profession, among them being O. D. Street, vice-president of Lord and Thomas and Logan; Edwin S. Jefferies, of Lyddon, Hanford and Kimball, and F. S. Hale, of the New York *Evening Journal*.

Servicing, retail sales and engineering problems encountered by the dealer were discussed at the dealer's session in the afternoon.

With few exceptions, the papers and

addresses were capably prepared and presented so that the poor attendance at most of the sessions was particularly noticeable and regrettable. However, in spite of the small number present at the meetings, those who were fortunate enough to attend were well repaid, and the quality of the programs reflected a great deal of credit on those in the Association who were responsible for arranging the sessions and securing the speakers.

Exhibits

Names of exhibitors, together with a list of the products each planned to display at the convention, was printed in THE HEATING AND VENTILATING MAGAZINE for April. A detailed description of the booths and exhibits would fail to do them justice, as the majority of the burners and accessories were displayed in such a pleasing manner that they could not fail to attract the average home-owner even though he had no special interest in oil burning, while all of them had an appeal for those engaged in some phase of the industry. In fact, several suggestions were made that the exhibit rooms should be closed during the sessions in order that the meetings would be attended by delegates who were absorbed by the displays to the exclusion of other interesting features of the convention.

Petro and Nokol Merge

April witnessed the merging of two of the most important oil-burner manufacturing companies in this country when the Petroleum Heat and Power Company of Stamford, Conn., merged with the American Nokol Corporation of Chicago. The dealer organizations of both Petro and Nokol will retain their separate identity.

Petroleum Heat and Power Company was formed in 1915, and has built up a large business in the distribution of fuel oil and the manufacture of oil burners using heavy oil. The Nokol Company is the owner of many basic patents covering automatic oil-heating systems and is well known in the industry.

W. C. McTarnahan, president of the Petroleum Heat and Power Company, will continue as president of the merged company, while Morgan J. Hammers, president of the American Nokol Company, will act as vice-president in charge of manufacturing of the new corporation.

Purchase of the 12-acre plant of the Stollwerck Chocolate factory by Petroleum Heat and Power Company also was announced. This property adjoins the present Petro plant at Stamford, Conn., and will add 135,000 sq. ft. of floor space to the 75,000 sq. ft. of Petro's present plant. Work already has been begun in adapting the old chocolate works to the needs of oil-burner manufacturing and the grounds are being made over into an oil-tank farm, having 15,000,000 gal. capacity.

Oil Heating Association Adopts Standard Contract Form

At the regular monthly meeting of the Oil Heating Association of Montreal, Canada, April 1, consideration was given to a standard form of contract to be used by association members in their dealings with clients.

A special committee has had this matter under consideration and sufficient progress was made at this meeting to have the principal clauses of the contract form endorsed. It will be prepared in detail and submitted to the attorneys of the association for approval. John H. Lewis, president, and J. F. Broadbent, secretary, were selected to represent the Montreal association at the American Oil Burner Association Convention in New York.

With the membership application of the Sun Oil Company, Ltd., received at this meeting, all the oil companies selling domestic fuel oil in the Montreal district have become affiliated with that association's activities.

Reports from Canada indicate that consideration is being given by the firms in Ottawa, Ontario, dealing in oil-heating equipment as to the advisability of forming a local association in that district.

The Canadian representatives of the Oil Heating Association sent an invitation to the American Oil Burner Association to hold their seventh annual convention in the City of Toronto. Inasmuch as many of the American manufacturers are represented in Canada, the invitation will be given careful consideration.

Williams Oil-O-Matic Convention

Williams Oil-O-Matic, Ice-O-Matic, Dist-O-Stove and Dist-O-Matic dealers will attend the fifth annual international convention in Bloomington, Ill., June 3-4. Unit No. 6 at the Williams factory will be given over entirely to convention activities. Speakers have been arranged for and the Williams Sync-O-Matics will entertain the delegates.

Quiet May Convention

Quiet May dealers from all parts of the United States and Canada will meet in a convention at the plant of the May Oil Burner Corp., Baltimore, May 27-28. Lectures on sales and servicing of the Quiet May burner will be given as well as talks and addresses by company officials. An entertainment program also has been planned.

Chicago Oil Burner Association

Chicago Oil Burner Association, at its regular meeting, April 16, was shown a film on the making of a modern newspaper presented by W. R. Blend of the *Chicago Tribune*. Chairman H. E. Risher, of the entertainment committee, announced that the association's annual golf tournament and field day was scheduled for April 26. At this tournament the major prize is the Risher cup, legs on which are now held by J. H. McIlvaine and F. C. Staples.

Oil Conservation Program Held Up

Conservation of the nation's oil supply and the difficulties being experienced by the refiners in carrying out the program for restricting the oil output in this country constitute matters of far-reaching importance to the industry.

At the meeting of the American Petroleum Institute in March, a program for reduction in oil production was agreed upon by the refiners, but a decision by the Attorney General shortly after was to the effect that such an agreement was in violation of the Clayton and Sherman acts and consequently illegal. The suggestion was then made by the Federal Oil Conservation Board that states having the largest production of oil enter into a compact with each other with the aim of agreeing on the reduction program. Since the Constitution prohibits the making of treaties or agreements between the states unless permission is granted by Congress, this idea cannot be carried out without careful investigation.

At a meeting of the American Petroleum Institute, April 24, the directors agreed to be guided by the efforts of the Federal Oil Conservation Board. The board plans to have Dr. George Otis Smith visit and interview the governors of the three or four dominating oil-producing states to learn their views on the question of interstate agreement.

Heating and Ventilating for Texas Engineers

Heating and ventilating will be taught to all engineering students at the University of Texas beginning next fall. A two semester-hour course will be given to architects, and a three semester-hour course to mechanical and architectural engineers.

Report on Heat Transfer by Radiation

In a preliminary report issued by the Sub-Committee on Heat Transmission, Division of Engineering and Industrial Research of the National Research Council, a summary is presented outlining what is known and what is not known on the subject of "Heat Transfer by Radiation." Supplementing the report is a bibliography on the subject.

W. H. Carrier, president of the Carrier Engineering Corporation, is chairman of the Committee on Heat Transmission of the National Research Council, whose headquarters are at 40 West 40th St., New York. W. V. A. Kemp is director.

Another publication issued by the committee contains a directory of research on heat transmission in the educational institutions of the United States. Some thirty-two institutions are listed. Among them are the Agricultural and Mechanical College of Texas, where Prof. F. E. Giesecke is conducting research on heat transmission through roof construction; Armour Institute of Technology, where Prof. J. C. Peebles is investigating heat transmission of building materials; Brown University, where Profs. W. H. Henderson and Z. R. Bliss are studying heat transmission through blanket materials; California Institute of Technology, where Prof. William N. Lacey is investigating thermal conductivity of liquids; Columbia University, where Prof. W. L. Sevringhouse is testing insulating materials such as those used in building construction and woven goods; Massachusetts Institute of Technology, where Prof. C. L. Norton is in charge of studies of thermal conductivities at high temperatures and where Prof. H. C. Hottel is making studies of radiation; and Purdue University, where Prof. G. W. Sherman, Jr., is studying the thermal conductivity of loosely-packed insulating materials, with particular reference to the effect of density on their conductivity.

Among the other studies listed in the directory are those that are being planned at the University of Illinois in its low-temperature testing plant; tests at the University of Kentucky being conducted by Prof. Lester S. O'Bannon on fin-type radiators, with reference to the relation between air velocity, steam condensing capacity, air temperature rise, fin temperature and the different proportions of fin surface and prime surface; tests at the University of Michigan, in charge of Prof. C. H. Fessenden, on radiator performance (two identical electrically-heated radiators being installed in the same room so that they may be operated in unison under the same air conditions, one radiator being left bare and the other coated with various paints); tests at the University of Minnesota, in charge of Prof. Frank B. Rowley, on building insulation, with special reference to the thermal transmittance of air spaces; University of Tennessee, where Prof. W. R. Woolrich is studying heat losses from underground piping systems; and University of Washington, where an investigation has recently been completed on heat insulation for household hot water tanks equipped with electric heaters.

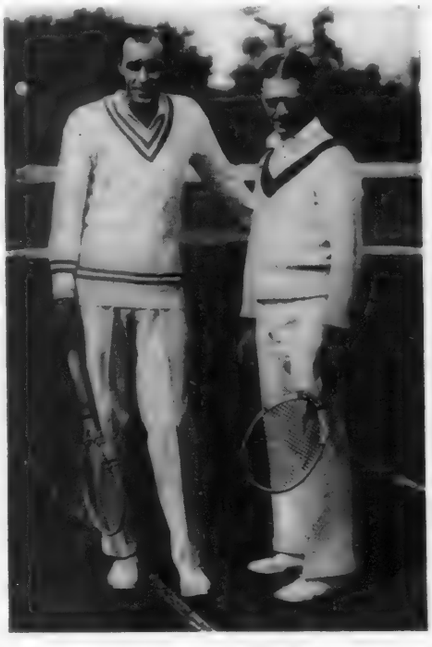
Gas Send-Out Records Broken

The maximum daily send-out record of the Peoples Gas Light and Coke Co., Chicago, was broken twice within a week during January. On January 13, the 24-hour send-out was 173,368,000 cu. ft., while less than a week previous a record had been established with 168,000,000 cu. ft.

Unusually low temperatures during the month—the average daily reading was 5.9° below normal—and the increasing popularity of gas for house-heating, doubtless were contributing factors toward the establishment of the successive records.

American Radiator Salesman Ranks High in Tennis

With no instructions, learning entirely by playing and observation, J. Gilbert Hall, an American Radiator Company salesman in the New York office, has advanced in four years to fifteenth place in the national list of amateur tennis players. Last year Hall beat Julius Seligson in the central Pennsylvania tourney at Allentown, won four minor tourneys in the metropolitan district and was runner up to John Doeg at the Orange Lawn Tennis Club tourney.



J. Gilbert Hall with "Big Bill" Tilden

Mr. Hall's rise in the tennis world is especially remarkable because he has no established club affiliations or college court accomplishments. Since graduating from high school in Elizabeth, N. J., Mr. Hall has given most of his time to selling Arco boilers. During the past winter he won the title in the Canadian championship tourneys, beating both Jack Wright, Canadian Davis Cup captain, and George Lott, third ranking star of this country.

Boiler Manufacturers Adopt Code of Ethics

What is designated as "Just a Start to a Code of Ethics," has been adopted by the National Boiler and Radiator Manufacturers Association. The code reads:

1. We will not make false or disparaging statements respecting a competitor's business methods, practices or products.
2. We will not knowingly solicit an order after it has been placed.
3. We will be diligent in preventing our employees from making statements or promises not authorized by the company.
4. We will invoice all goods at the true selling price.
5. We consider our industry a most worthy one, and by methods that are not inconsistent with our long established trade relations, shall diligently cultivate the large field that awaits radiator heat by so framing our policies as to obtain for our industry the broader market it merits.

Those who signed the code are:

H. B. Smith Co., Edwin W. Smith.
Richardson & Boynton Co., H. T. Richardson.
Thatcher Co., R. C. Cook.
Wm H. Page Boiler Co., H. C. Hersey.
Burnham Boiler Corp., A. E. Bastedo.
Abram Cox Co., Louis J. Odets.
Columbia Radiator Co., F. Thomas Nason, president.
National Radiator Corp., Jno. H. Waters.
Universal Smokeless Boiler Co., George W. Franzheim.
Boynton Furnace Co., By W. Ritchie, vice-president.
Richmond Radiator Co., By A. H. Schroth, vice-president.
American Radiator Co., By Rolland J. Hamilton, vice-president and secretary.
Weil-McLain Co., W. R. Stockwell.
Frank Prox Co., Robert F. Prox, vice-president.
Lincoln Radiator Corp., W. C. Murray.
Landon Radiator Co., Inc., A. A. Landon, president.
Pierce, Butler & Pierce Mfg. Corp., Philip J. Flaherty, vice-president.
United States Radiator Corp., Henry T. Cole, president.
Abendroth Bros., A. S. Grant.
Peerless Heater Co., H. E. Gambrill, treasurer.
L. J. Mueller Furnace Co., L. J. Mueller, Jr.
Hart & Crouse Co., by Merwin K. Hart, president.
International Heater Co., Russell Wheeler, vice-president.
Minnesota Radiator Co., By H. C. Strong, president.
Spencer Heater Co., Charles N. Tull, president.

Correspondence

A Problem in Vapor Heating

EDITOR HEATING AND VENTILATING MAGAZINE:

Fig. No. 1 shows a proposed method of installing a heating system, and we would appreciate advice through the columns of your magazine whether or not it is practical to install it as shown.

The returns from the unit heaters must drip into the wet return and can be vented into the dry return; if traps should be placed on the line to the wet return, we would ask that you advise whether or not combination float and thermostatic traps, commonly called blast traps, are preferable to plain thermostatic traps. This also applies at the end of the main.

We also will appreciate your advising whether there would be any economy in the operation of the system if it were vented through a vacuum vent valve in place of an open vent valve.

Also we would like to know whether or not, in place of using traps to handle the condensation from the unit heaters and the end of the mains, if a separate wet return would be preferable.

Philadelphia, Pa. JOHN M. SEWELL

The method shown in Fig. 2 is to be preferred with all unit heaters connected as shown for No. 1 unit, or if desired with all unit heaters connected as shown for No. 2 unit. Method No. 1 (Fig. 2) requires that the first rush of condensation be taken care of by blast traps which are preferable because they are of large area and responsive, being sensitive to water rather than to temperature. A blast trap also should be used at the end of the steam main shown in Fig. 1, but its use is avoided in Fig. 2.

Unit No. 2 avoids the use of any form of condensation trap and therefore will pass the water freely, air being vented through a small thermostatic trap. This trap should be located as shown, high up above any water likely to be retained back of the check valve. The check valves also should be well elevated as shown in order to avoid lifting of water from the return drop above the check as might occur with vacuum formed in the unit when the shut-off valve is closed and the check valves located down near the wet return (See Fig. 1).

The thermostatic traps on the radiating surfaces shown in Fig. 2, when working properly, prevent the entrance of steam into the dry return, hence the end of the steam main should be separately piped to the boiler side of the check valve at the alternating receiver or direct-return trap, as it is variously called.

There is no particular reason for using a separate wet return from the unit heaters. A separate steam supply is sometimes used, much depending upon the arrangement and proportion of direct radiation surface to unit heater surface and the length of run or piping required. Vacuum vent valves, of course, rid the piping more quickly of air and make the system more responsive. The economy due to low temperatures in the direct radiation is also obtained, as well as in the unit heaters, unless the latter are manually or automatically controlled so as to proportion the heat input to the heat demands. T. W. REYNOLDS

EDITOR HEATING AND VENTILATING MAGAZINE:

I am in receipt of your letter with copy of material to be published in THE HEATING AND VENTILATING MAGAZINE, and wish to thank you for the interest shown in this connection.

You state that the end of the steam main should be separately piped to the boiler side of the check. With this in mind, I do not see but that the drips from the unit heaters should also go back in this separate connection and not in the wet return which drips the dry return; in other words, it is my thought that if the dry return pitches to a low point away from the boiler, it should be returned through the direct return trap, and any drips from the steam main or through apparatus which is not trapped should be run into another wet return directly back into the boiler instead of to the direct return trap.

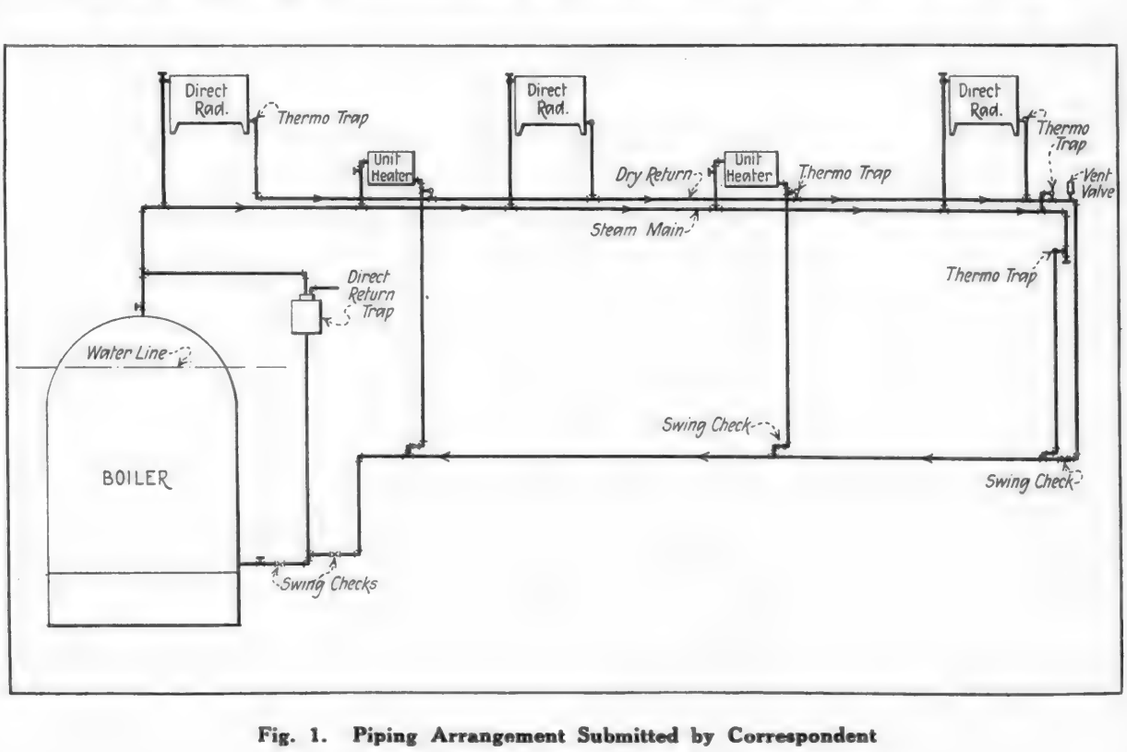


Fig. 1. Piping Arrangement Submitted by Correspondent

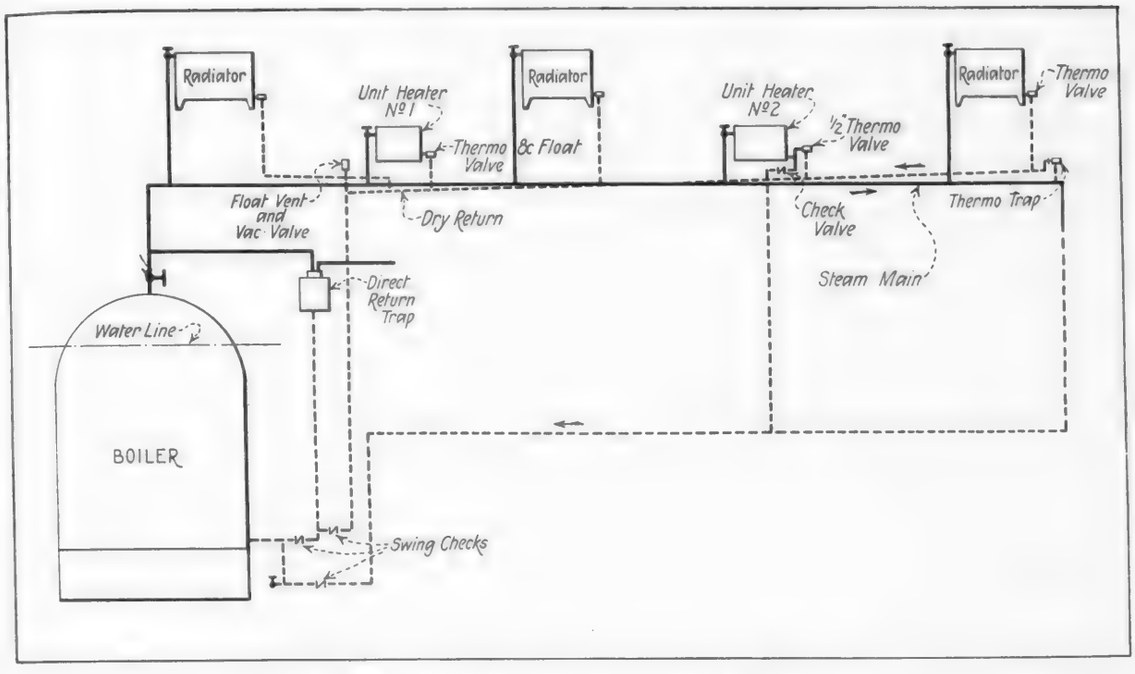


Fig. 2. Suggested Method of Connecting Unit Heaters

As a matter of fact, I had a troublesome installation where the unit heaters were not trapped and discharged their condensation into the wet return that the dry return was dripped into. Blast traps were then installed and the difficulty was overcome.

Philadelphia, Pa. JOHN M. SEWELL

To make the entire question clearer it should be pointed out that the method shown in Fig. 1 is a combination—a two-pipe gravity system for the unit heaters and a thermostatic trap system for the direct radiators. The system is open to objection because the swing checks are submerged, hence not readily accessible. Furthermore, the water above them can return into the unit heaters when these are under vacuum due to condensation taking place when the heaters are valved off. The thermostatic trap at the end of the steam main also will allow water to pass backward under the same conditions.

The main objection is that the swing check on the dry return will stay closed for some time because the dry return has no pressure within it, whereas the wet return is under pressure from the steam directly through the unit heaters. This is the reason for piping the end of the steam main and unit heater No. 2, as shown in Fig. 2, separately to the boiler side of the check valves at the direct return trap, that is, separately from unit heater No. 1 (the alternative method) and the direct radiators equipped with thermostatic traps. All condensation passing through the thermostatic traps should go to the return trap and all other condensation should pass around the return trap. This is the distinction to keep in mind—unequal pressures or pressure above atmosphere and those below must be separated. Our correspondent adhered to these principles when he corrected the installation referred to in the last paragraph of his second communication.

T. W. REYNOLDS

Anthracite and Its Competitors

EDITOR HEATING AND VENTILATING MAGAZINE:

The writer has read the article entitled "Anthracite and Its Competitors," by Noel Cunningham, in THE HEATING AND VENTILATING MAGAZINE for January, and was particularly interested in the schedule appearing at the top of page 54, in which the author assigns a cost of $332 for an average eight-room suburban house burning buckwheat coal costing $9 per ton, or substantially 37 tons for the season.

During the nine years that I have occupied my nine-room residence in Westfield, the greatest amount of coal I have burned is 14 tons of No. 1 buckwheat. I have a double-grate Spencer heater rated at 1600 sq. ft. of hot-water radiation with about 830 sq. ft. of radiator surface distributed in sixteen radiators varying from 15 sq. ft. to 70 sq. ft. The house is about 15 years old and none too tight in its construction. The floor areas of the first and second floors are substantially 1150 sq. ft. each, with a heated room on the third floor of about 90 sq. ft. floor area. Ceilings of first and second floors average 9 ft. 6 in.

On account of my family consisting of one very elderly person and young children, the heating season usually begins around September 15, and has continued as late as June 10, but we have never required more than 14 tons of coal in one heating season. I obtain coal, varying very considerably in quality as respects volatiles and also fusion point of ash, at a price less than $9 per ton in the bin, but my coal consumption is greatly at variance with the 37 tons which Mr. Cunningham allots to an average eight-room house. My house has rooms considerably larger than the average house of more recent construction.

New York, N. Y. J. H. T.

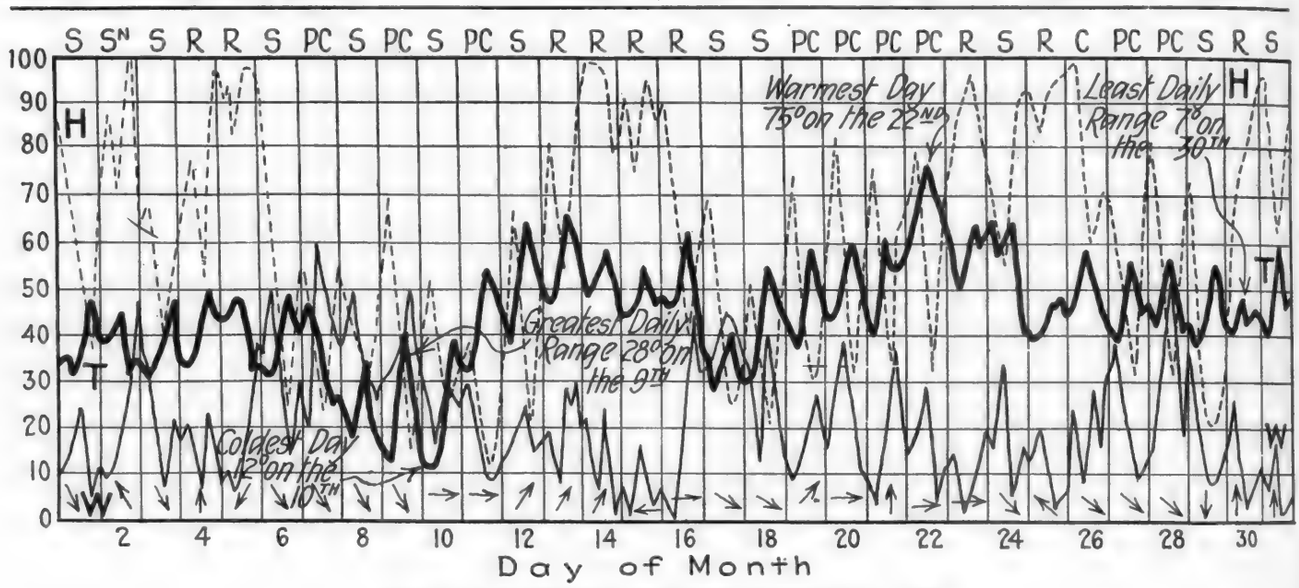
Your correspondent has derived the figure of 37 tons by dividing my total cost of $332 by $9, which he has paid for buckwheat. The $332 included three-year and ten-year depreciation which is a large part of the total. Consequently, J. H. T. has misread the table and also the explanation of the table which occurs on page 53 of the January issue.

We find that about three tons of coal are required per hundred feet of installed steam radiation. This of course presupposes that the radiation is about right for the house. If J. H. T. is heating eight rooms and using over 800 feet of steam radiation he is very much overradiated, and the figure of three tons per hundred feet would not apply. Normally, an eight-room house would have about 375 feet of installed steam radiation, and this, at three tons per hundred feet, would be a little over eleven tons a year, which I believe would be about in line with the figures in my tabulation.

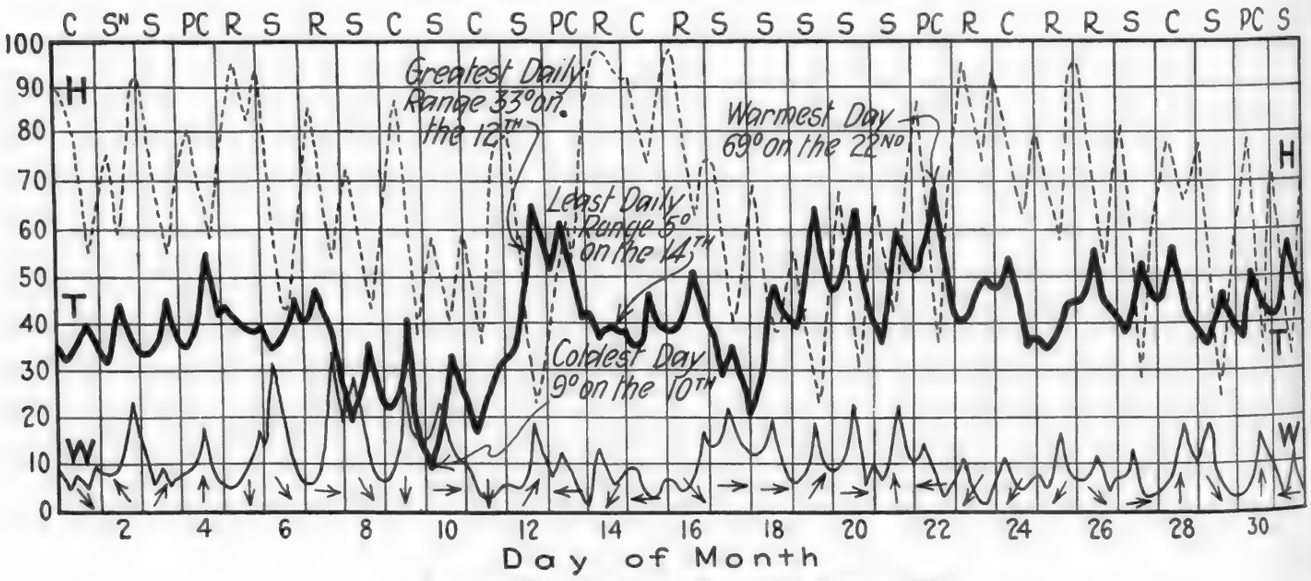
New York, N. Y. NOEL CUNNINGHAM

The Weather for March, 1929

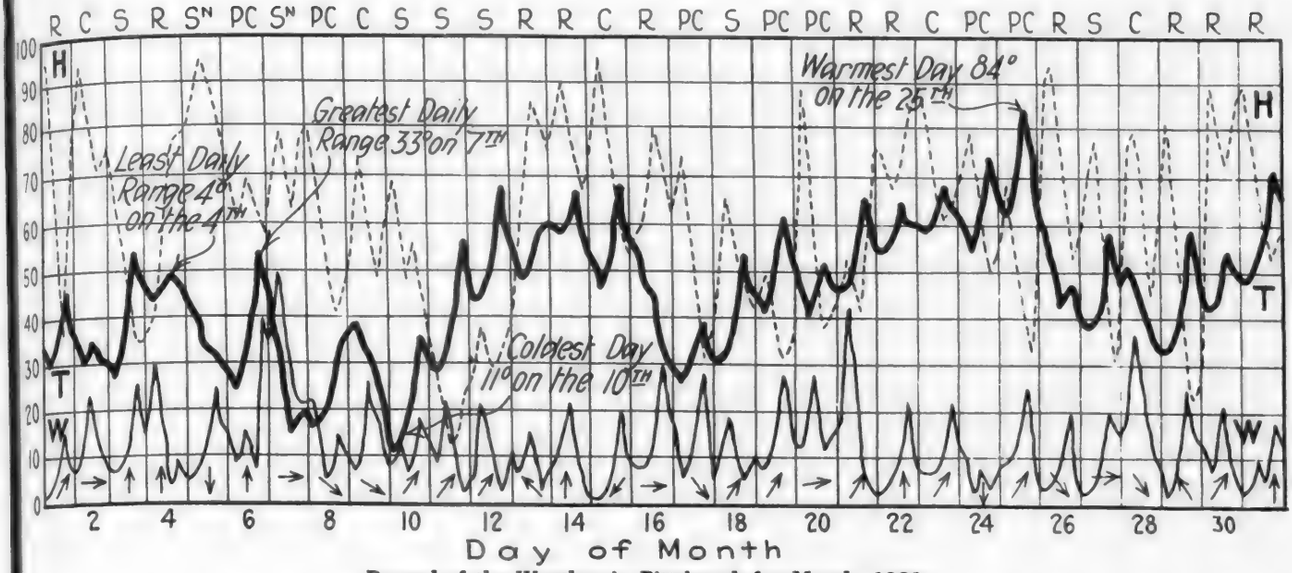
	New York	Boston	Pittsburgh	Chicago	St. Louis
Highest temperature, degrees F.	75	69	84	71	92
Date of highest temperature	22	22	25	24	24
Lowest temperature, degrees F.	12	9	11	9	22
Date of lowest temperature	10	10	10	7	10
Greatest daily range, degrees F.	28	33	33	36	40
Date of greatest daily range	9	12	7	6	6
Least daily range, degrees F.	7	5	4	3	3
Date of least daily range	30	14	4	16	3
Mean temperature for month, degrees F.	45	46	46	43	51
Normal mean temp. for month, degrees F.	38	35	40	35	44
Total precipitation, this month, inches	3.51	2.79	2.15	5.23	5.33
Total snowfall, this month, inches	0.3	4.0	3.1	0.7	Trace
Normal precipitation, this month, inches	3.64	3.57	3.03	2.58	3.38
Total wind movement, this month, miles	13,166	7,136	8,604	8,712	9,995
Average hourly wind velocity, miles	17.7	9.6	11.5	11.7	13.8
Prevailing direction of wind	N.W.	W.	S.W.	S.W.	S.
Number of clear days	10	12	4	7	12
Number of partly cloudy days	12	6	10	12	8
Number of cloudy days	9	13	17	12	11
Number of days with precipitation	12	11	16	9	11
Number of days with snowfall	1	2	4	2	1
Snow on ground at end of month	None	None	None	None	None


S SN S R R S PC S PC S PC S R R R R S S PC PC PC PC R S R C PC PC S R S
Warmest Day 75° on the 22ND
Least Daily Range 7° on the 30TH
Greatest Daily Range 28° on the 9TH
Coldest Day 12° on the 10TH
H
T
W
Day of Month

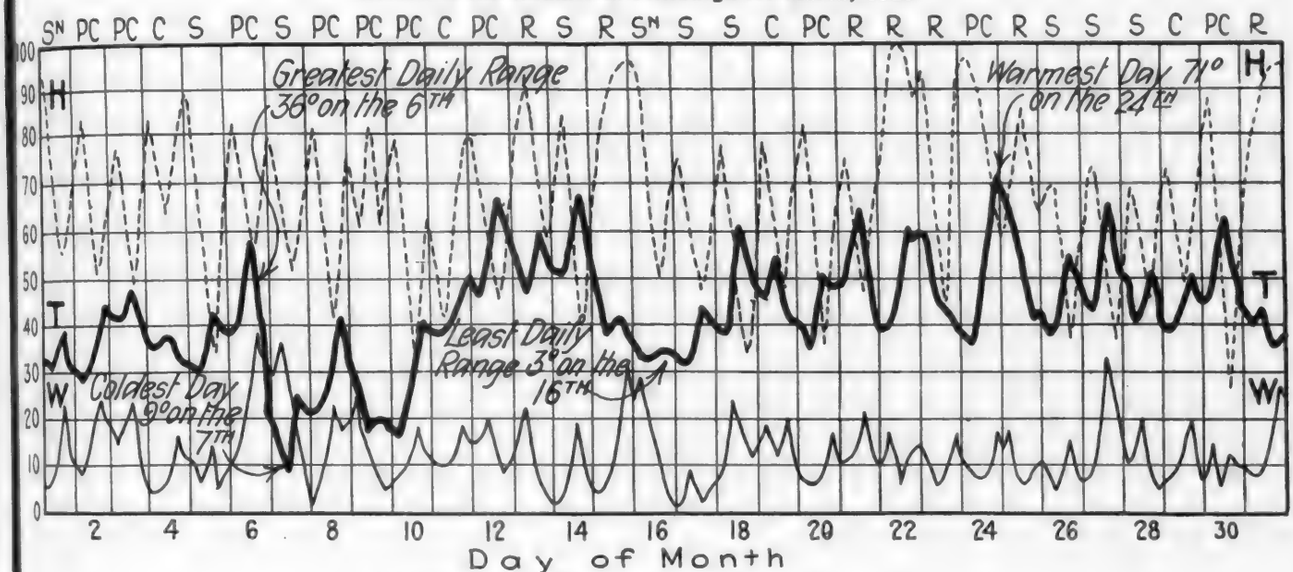
Record of the Weather in New York for March, 1929
(Hourly Observations of the Relative Humidity Plotted on this Chart)


C SN S PC R S R S C S C S PC R C R S S S S S PC R C R R S C S PC S
Greatest Daily Range 33° on the 12TH
Warmest Day 69° on the 22ND
Least Daily Range 5° on the 14TH
Coldest Day 9° on the 10TH
H
T
W
Day of Month

Record of the Weather in Boston for March, 1929


R C S R Sn PC Sn PC C S S S R R C R PC S PC PC R R C PC PC R S C R R R
H
T
W
Least Daily Range 4° on the 4TH
Greatest Daily Range 33° on 7TH
Coldest Day 11° on the 10TH
Warmest Day 84° on the 25TH
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
Day of Month

Record of the Weather in Pittsburgh for March, 1929


Sn PC PC C S PC S PC PC PC C PC R S R Sn S S C PC R R R PC R S S S C PC R
H
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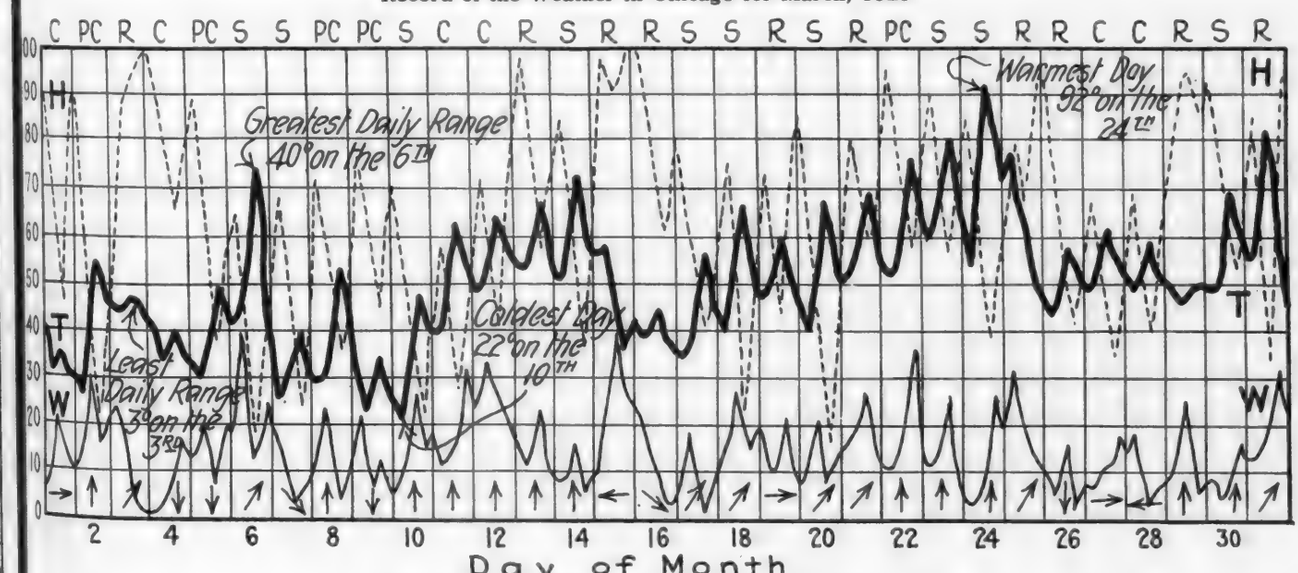
W
Greatest Daily Range 36° on the 6TH
Coldest Day 9° on the 7TH
Least Daily Range 3° on the 16TH
Warmest Day 71° on the 24TH
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
Day of Month

Record of the Weather in Chicago for March, 1929


C PC R C PC S S PC PC S C C R S R R S S R S R PC S S R R C C R S R
H
T
W
Greatest Daily Range 40° on the 6TH
Least Daily Range 3° on the 3RD
Coldest Day 22° on the 10TH
Warmest Day 92° on the 24TH
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
Day of Month

Record of the Weather in St. Louis for March, 1929

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE by the United States Weather Bureau.
Heavy lines indicate temperatures in degree F. Light lines indicate wind in miles per hour.
Broken lines indicate humidity in percentage from readings at 8 A.M., 12 M., and 8 P.M. Arrows fly with prevailing directions of wind.
C—clear, PC—partly cloudy, C—cloudy, R—rain, Sn—snow.

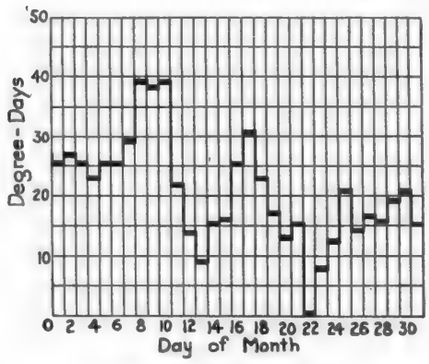
Monthly Heating Load in Degree-Days in Nine Typical Cities

DEGREE-DAY charts for representative cities in the United States are presented for use by heating contractors, house-heating managers of gas companies, heating appliance salesmen, and others interested in fuel consumption. At the end of the season these graphs can be pasted together and the heating load will be represented by a continuous line for the season.

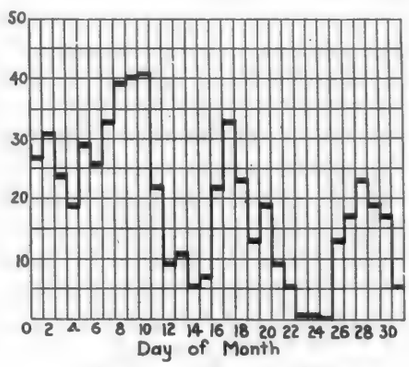
The degree-day is a unit coined by the American Gas Association and is the product of 1° in temperature and 1 day. When the average daily temperature falls below 65° the heating load is proportional to the difference between the daily temperature and 65°, and the number obtained represents the number of degree-days for that day.

When the average daily temperature is 54°, for example, the number of degree-days for that day is (65-54) or 11. When the average temperature is 40°, the degree-days total 25.

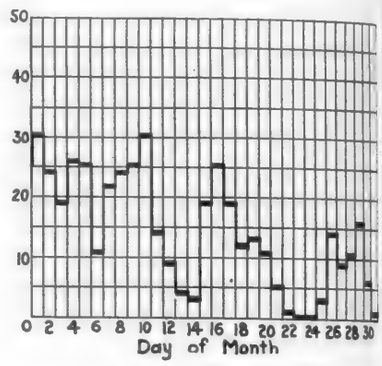
The total number of degree-days for a given month when divided by the yearly total will give the percentage of heat demand for that particular month. Unit fuel consumption figures, in quantities of fuel per degree-day per square foot of radiation or per square inch of leader pipe, are available for different fuels, different types of heating systems and for various grades of fuels, so that fuel consumption problems can readily be solved by applying degree-day data.



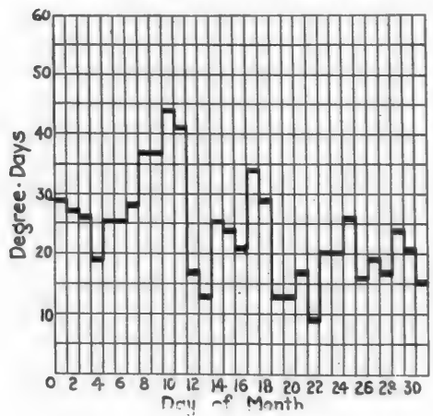
New York, March, 1929
Degree-Days 639—Degree-Days to Date 4252



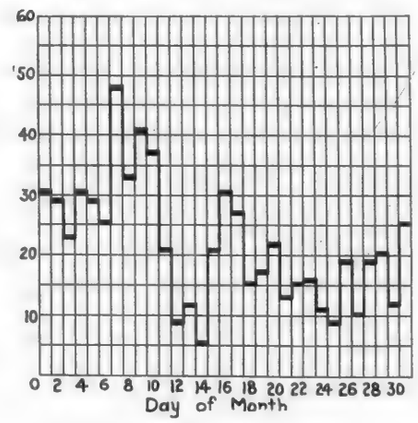
Pittsburgh, March, 1929
Degree-Days 583—Degree-Days to Date 4752



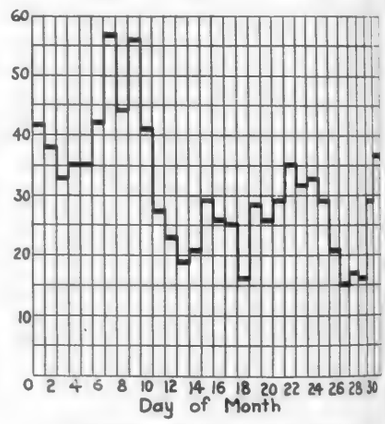
St. Louis, March, 1929
Degree-Days 431—Degree-Days to Date 4245



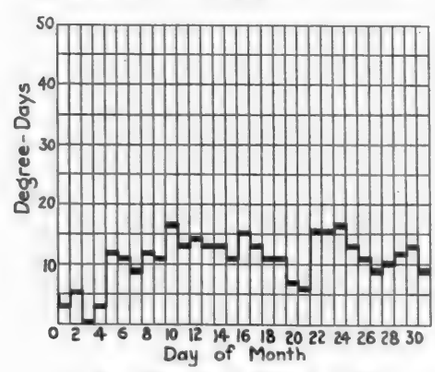
Boston, March, 1929
Degree-Days 731—Degree-Days to Date 4628



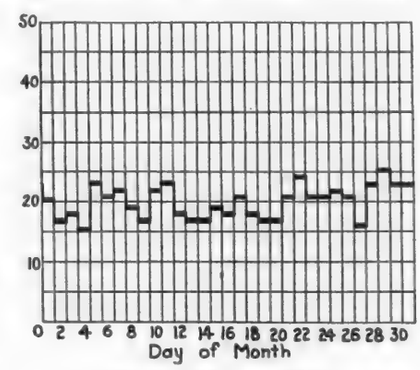
Chicago, March, 1929
Degree-Days 676—Degree-Days to Date 5546



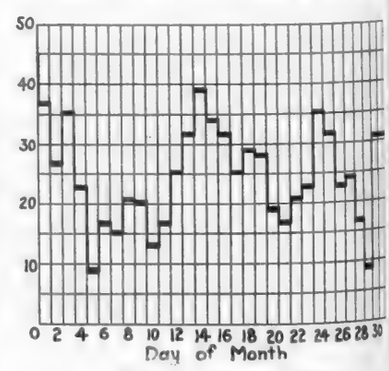
Minneapolis, March, 1929
Degree-Days 956—Degree-Days to Date 7169



San Francisco, March, 1929
Degree-Days 336—Degree-Days to Date 2324



Seattle, March, 1929
Degree-Days 619—Degree-Days to Date 4248



Denver, March, 1929
Degree-Days 760—Degree-Days to Date 5400

A Proposed New Unit of Evaporation

Acting upon a suggestion made by Webster Tallmadge, president of Webster Tallmadge & Co., Inc., New York, the Main Committee on Power Test Codes of the American Society of Mechanical Engineers, has gone on record as favoring the adoption of the following units and symbols for evaporation in boilers.

B = 1 B.T.U.
KB = 1000 B.T.U. (kilo)
MB = 1,000,000 B.T.U. (maga)

It was further voted that Individual Committee No. 2 on Definitions and Values, be instructed to include a footnote in the Code on Definitions and Values relative to defining the above units and symbols, which are multiples of B.T.U., and that Individual Committee No. 4 on Stationary Steam Boilers be instructed to substitute the symbol "B" "KB" "MB" for "UE" (units of evaporation) in the definitions included in the Test Code for Stationary Steam Boilers.

During the discussion which led up to this action a communication from Prof. William Jay Dana, of the North Carolina State College, was read in which he proposed to use of "Bute" as a name for the boiler unit of evaporation. Another suggestion was the word "Therm." In view of the effort toward international agreement on test codes, however, it was realized that it would be very undesirable at this time to use "Therm," due to the fact that the word had already been embodied in an act of Parliament in England relating to the heating value of gas.

American Air Filter Company Acquires Patents

An important development in the air filter field is the organization of the American Air Filter Company, Inc., which has acquired 39 foreign and United States patents and 50 applications for patents now pending, covering unit and automatic air filters of both dry and viscous types. The company has licensed the following manufacturers under these applications and patents: General Air Filter Corporation, manufacturer of the Ace filter; Midwest Air Filters, Inc., manufacturer of Midwest air filters; National Air Filter Company, manufacturer of National air filters, and Reed Air Filter Company, manufacturer of Reed air filters.

Each of the operating companies will continue to function as individual units. under the same management as in the past, but by coordinating the research and development activities, they will have available a corresponding amount of technical advice.

Combined service departments already have been established in New York and Chicago. This development will be extended to other cities as rapidly as possible.

Officers of the American Air Filter Company are as follows: President, W. M. Reed; vice-president, H. C. Murphy; vice-president and secretary, John Hellstrom; treasurer, F. M. Greer. The head office of the company is located in Louisville, Ky.

Slight Decline in Briquet Production

Reports furnished to the U. S. Bureau of Mines by the operators of briquet manufacturing plants show that there was a decrease of 2.4% in the production of fuel briquets in 1928, from that in 1927.

The total production of briquets in 1928 amounted to 947,423 tons valued at $7,705,617. Despite an abundant supply of both anthracite and bituminous coal throughout 1928, briquet sales declined only 4.8% from the high level set during 1926, when the demand was greatly stimulated by the anthracite strike.

However, the imports of fuel briquets in 1928 increased 18% over 1927. About 97% of the total importations were received at Massachusetts ports, and 95% of the total originated in Germany and The Netherlands.

Separate Contracts for Heating and Plumbing Work

Another instance of the distinction between the work of the heating and plumbing contractors is to be seen in the list of firms furnishing the equipment for the Temple Beth Zion in Buffalo. It will be noted that the heating contract was carried out by one firm and the plumbing contract by another. In fact, in this building the ventilating work also was handled as a separate contract.

Finding and Stopping Waste in Modern Boiler Rooms

The third edition of "Finding and Stopping Waste in Modern Boiler Rooms," edited by George H. Gibson, was announced recently by the Cochrane Corp., Philadelphia. This is a reference book of text, tables and charts, compiled from papers read before engineering societies, books, articles, technical periodicals, and publications of the United tates Bureau of Mines, and put into convenient form for owners, managers, firemen, engineers and others interested in boiler plant economy.

The first two sections are the ones which probably will be most interesting to heating and ventilating engineers. The first, on the subject of fuel, includes data on the classification of coal, appraisal of coal, and complete instructions for sampling and analyzing coal samples. Classifications for coal, washing coal, and coal measurements are taken up in this section followed by a large amount of information on the subject of oil and gaseous fuel.

The second section takes up the subject of combustion in great detail and includes data on the chemistry of combustion, proper methods of buying, furnace temperatures, drafts, flue and stack proportions, boiler room instruments and how to use them, soot and smoke prevention, stokers and grates, and the combustion of fuel oil and gaseous fuels.

Heat transmission, boiler efficiency and testing, feed water heating and conditioning are all taken up in the remaining three sections. The material is presented in a way that makes it possible for an engineer to select and operate boiler-room equipment at the highest efficiency possible. The final section discusses heat balancing, water conditioning and protection of the boiler and auxiliary equipment from scaling, embrittlement and corrosion. Size 5 in. x 7 in. Pp. 804, price, $3.

William L. R. Lynd

William L. R. Lynd, superintendent of the Richardson & Boynton Company's plant at Dover, N. J., until five years ago, when he resigned, died recently at his home in that city after a long illness. Mr. Lynd, who was 72 years old, was superintendent of the Brooklyn, N. Y., plant of the company before the plant was moved to Dover in 1897. He served the company for 45 years. Recently he also was mayor of Dover. At the time of his death, Mr. Lynd was president of the Morris County Realty Company, a member of the board of directors of the State Hospital at Morris Plains, N. J., and at one time was a member of the Democratic state committee. His widow and seven children survive him.

Daniel Kennedy

Glancing Backward

High Lights in the Evolution of Leaders in the Heating and Ventilating Industry

XIII — Kennedy Valve Manufacturing Company

FIFTY-TWO years ago—in 1877—Daniel Kennedy started to make gate valves in a little shop on one of the floors of a four-story building on Gold Street in lower Manhattan, New York City.

The business had not been long established when Mr. Kennedy—then less than 30 years old—found an opportunity to display his initiative and ability. The Boston dry dock (now part of the Robbins Dry Dock and Repair Company in the Erie Basin, Brooklyn, N. Y.) was built to provide what were unusually large facilities for those days, and the valve equipment for controlling the flow of water in and out of the dock was an important factor in assuring its successful operation. From competitive designs submitted by valve builders of that period, those of Daniel Kennedy were chosen, and he was awarded the contract for building the gate valves, some of which weighed over 11 tons each.

Installation Made 50 Years Ago Still Operating Successfully

This first important contract involved heavy responsibilities in design, workmanship and installation, at a time when there were no bridges between New York and Brooklyn, no telephones or electric lights, and no present-day power facilities or high-speed automatic machinery.

However, the installation at the bottom of a 35-foot pit was made on time, the valves met every requirement of tightness and ease of operation, and today, after more than 50 years of daily operation and dependable service, they are still functioning properly and are thoroughly satisfactory to the engineers in charge.

The conscientiousness and skill displayed by Mr. Kennedy on this contract were typical of his work, and his valve building business was successful from the start, gradually increasing until his shop occupied the entire building on Gold Street.

An outstanding characteristic of Mr. Kennedy throughout his career was his readiness to tackle difficult service requirements. This was shown soon after he started in business by the dry dock installation described. Another example was the large valve installation which he furnished for the water supply system of the City of New York, during 1892. At that time New York City was still using water supplied by the Croton aqueduct system. Extensions made that year to the water system had brought the total city pipe line mileage up to 710 and the new apparatus, including these extensions, were widely noted as the last word in equipment.

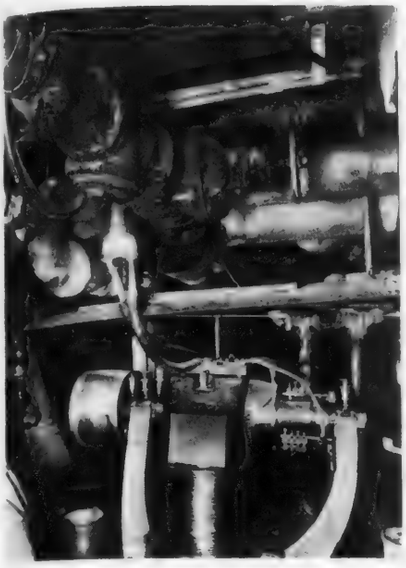
The First Kennedy Valves Were Made in this Little 4-Story Building in Manhattan

Valves for Croton Aqueduct Weighed 12 Tons

The valves which were built by Mr. Kennedy for these extensions were the largest and heaviest which had ever been applied to a water works system. An interesting article in *Scientific American* for October 15, 1892, fully describes the construction of these valves, mentioning that one of the 48-inch valves weighed between 11 and 12 tons, and required a truck with three teams of horses to move it across the city from the river front.

Still another example of Mr. Kennedy's initiative was his acceptance of an order from the New York Edison Company for cast steel gate valves, to be used for superheated steam at their Waterside Power Station in New York City. Although these valves were built in 1906, when the effects of superheated steam on various metals and the stresses arising from high pressures were still largely unknown, they met the requirements and have served satisfactorily for many years.

To provide greater manufacturing facilities the plant was moved in 1890 to Coxsackie, New York, and the name of the firm was changed to the Kennedy Valve Manufacturing Company. Business continued to develop with increasingly rapid strides, and the firm successfully



One of Earliest Superheated Steam Installations at New York Edison Company Plant, Kennedy Valves In Service Since 1906

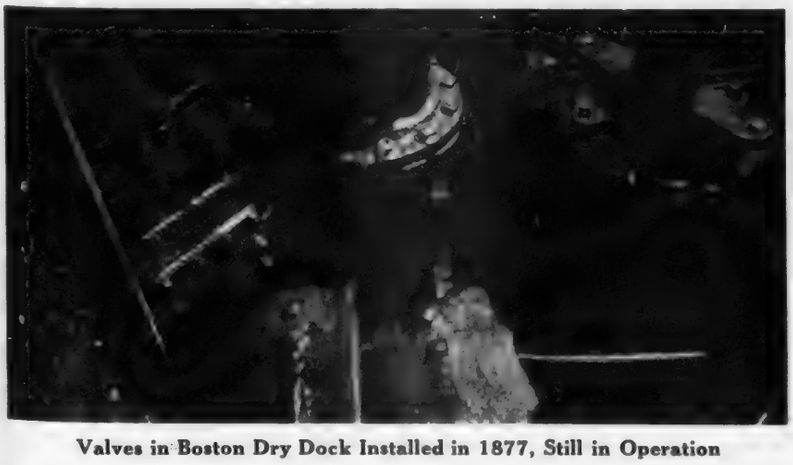
weathered the panic years which affected most lines of business. In 1907, even in the midst of a period of national business depression, it was found necessary to build a large modern plant, occupying 20 acres, at Elmira, N. Y. Again, in 1921, an additional 15-acre plant in Elmira was acquired for separate production of the malleable-iron pipe fitting lines that were added at that time.

Kennedy Plant in Two Distinct Units

The two present plants of the Kennedy Valve Manufacturing Company are independent units. Plant No. 1 is devoted to the manufacture of iron body, cast steel, and bronze valves, fire hydrants, brass or bronze fittings, and cast-iron flanged fittings and flanges. Plant No. 2 is used exclusively for the manufacture of malleable-iron pipe fittings.

The products of the Kennedy valve Manufacturing Company include standard type valves in sizes from ⅛-in. to 60-in. diameter of cast-iron, cast-steel, bronze or of special material. Besides the standard types and sizes, the company also designs and builds valves for many special requirements.

Throughout its half-century of development, the Kennedy Valve Manufacturing Company has been uninterruptedly under a single family ownership and management—an unusual record. From the inception of the business in 1877, to his death in 1928, Daniel Kennedy, founder of the business, was in active charge as president. Mr. Kennedy's sons, Matthew E. Kennedy, J. C. Kennedy and C. H. Kennedy, have all been connected with the company for over 20 years, and now direct the business as president, vice-president in charge of factory management, and vice-president in charge of sales, respectively. Many of the company departments in both of the Kennedy plants are in charge of men who have been associated with the Kennedy organization since their early working days.



Valves in Boston Dry Dock Installed in 1877, Still in Operation

Edwin S. Hallett's Career

In the *Christian Evangelist* of St. Louis, for April 4, an interesting sidelight is shed on the life of Edwin S. Hallett, whose death in St. Louis, March 26, was reported in last month's issue. Under the caption of "Leading St. Louis Disciple Dead," Mr. Hallett is characterized as one of the leading and most useful Disciples in St. Louis.

Mr. Hallett's death was due to pneumonia. He was 67 years old, and had been a resident of St. Louis about one-third of his life. A native of Indiana, he engaged in educational work for several years before he entered the engineering field in Louisville. It was in 1917 that he became chief engineer of the St. Louis Board of Education. He previously had been chief engineer for federal buildings in St. Louis, where he had charge of the construction of many of the finest government buildings in the Middle West. His subsequent career, as was recounted in last month's issue, gave him a national reputation through the practice he evolved for recirculating ozonized air in the ventilation of the St. Louis public schools.

Mr. Hallett was a member of the American Society of Heating and Ventilating Engineers, the St. Louis Electrical Board of Trade and a past member of the American Society of Mechanical Engineers.

He left his widow, one son, Samuel G. Hallett, and a daughter. His son is head of the Hallett Engineering Co., of St. Louis, one of the city's leading firms in the heating, ventilating and air conditioning field.

246 Scientific American. [OCTOBER 15, 1898.

MAMMOTH VALVE FOR WATER MAIN, NEW YORK CITY.

Valves for the Croton Water Supply System Described in Scientific American, 37 Years Ago

New Apparatus and Appliances

An Electrically-Heated Home

Homes and buildings in half a dozen cities were electrically heated during the past winter with a new method, developed by Chester I. Hall, president of the Hall Electric Heating Company, of Philadelphia, while a resident engineer of the General Electric Heating Company, in charge of its experimental laboratory at Fort Wayne, Ind. The buildings are known as homes without chimneys.

Large thermal storage tanks of water are heated, using electric current only at night, when it can be obtained from the utility at the lowest cost, and releasing this stored heat within the home as required. The same plan, either in conjunction with the home-heating system or independently, can be used to supply the domestic hot water needs.

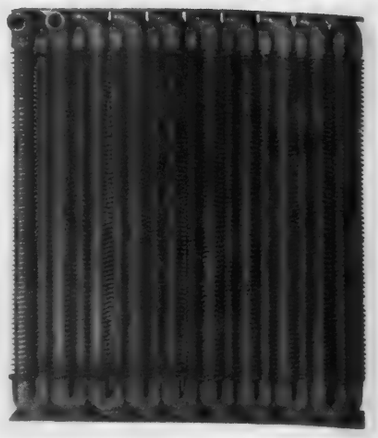
"Electric heating is no longer experimental, and the cost is reasonable," says Mr. Hall. "This is the second winter in which the system has been used in Fort Wayne, and from data received from that city, as well as from other restricted territories in which the company is operating, I feel sure that it is firmly established. I believe that the average eight-room home in the central belt of states, comprising Pennsylvania, Ohio, Indiana and Illinois, can be heated electrically for approximately $350 per winter, provided, of course, the building is well insulated.

"To the home-owner, the safety factor is perhaps the most important," Mr. Hall pointed out. "As there is no combustion in the house; there is, consequently, no danger from fire. It is noiseless and all energy purchased is delivered into the house as heat. It is simply the release of stored heat controlled by a thermostat. From the housewife's viewpoint it reduces to a minimum the cleaning of drapes and the need of redecorating, for the customary ashes, smoke and soot are entirely eliminated. In addition there is also the absence of obnoxious and dangerous gases and odors, which often come from other methods of heating."

The first sample installation consisted of a water tank containing electric heating elements. From an insulated air space around the tank the radiated warm air was distributed by pressure to various parts of the home, as necessity demanded. Automatic timers turned on the electric current during the off-peak period of the power company, and when the water became heated to proper temperature the electric current was automatically turned off. With temperatures as low as —5° F. this home was kept comfortably warm.

The Hall Electric Heating Company was formed a year ago. The General Electric Company, and associates, hold a substantial interest in the company and manufacture the control and electrical parts. The engineering, development and sales work of the Hall company are carried on at its main office in Philadelphia.

Hall Electric Heating System



Young Cooling Radiator

Blast Cooling Radiator

A radiator designed especially for use in connection with large blast cooling systems, has been brought out by the Young Radiator Co., Racine, Wis. It is made with heavy cast headers, internally ribbed and strengthened, to which are bolted Young copper cooling units. In the fabrication of the cooling unit itself, the fins are soldered to the tubes but a brazed joint connects the tubes to the headers. This construction is found to be especially advantageous where large capacity is required. The unit is tested at a hydraulic pressure of 175 lbs.

DeVilbiss Spray Painting Outfit

A spray painting and finishing outfit, type NC-601, has been announced by the DeVilbiss Co., Toledo, O. The set is complete with air compressors ready for use. The operator merely puts the material into the paint container, plugs the electrical connection into a light socket and is ready to apply the paint. This outfit delivers a finely atomized spray, adjustable from a round spray to a fan spray 3½ in. in width. The weight of the complete unit is 47½ lbs. Air supply is ample, as the pressure is always constant.

Wagner Furnace Fan

To raise the efficiency of warm-air furnaces is the purpose of the Wagner furnace fan, brought out by the Wagner Electric Corp., St. Louis, Mo. Installed in the cold-air intake, this fan forces air through the furnace, thereby increasing the flow of heated air in the leaders. Rubber cushions on the frame in which the motor is mounted, guard against vibration and noise, and, as an added precaution, springs support the fan itself. Three sizes are included, 12 in. for

small houses and large flats, 16 in. for large houses, and 18 in. for very large installations. Different operating speeds are obtainable through a control switch, or a thermostat can be used to obtain automatic operation.

Bryant Model 45 Gas Boiler

A line of completely enclosed gas-fired boilers has been announced by the Bryant Heater & Mfg. Co., Cleveland, O. Controls and other accessories are concealed, and the casing is covered with a crystalline finish similar to that used on cameras, office equipment and typewriters. An illuminated instrument panel, such as is used in automobile

Bryant Completely Enclosed Gas-Fired Boiler

practice, is provided to concentrate the gauges at one point.

These boilers can be supplied in 11 sizes with A.G.A. output ratings from 560 to 2410 sq. ft. of steam radiation. Boiler dimensions are: Width, 16 in. to 52 in.; height, 48 in.; depth, 30¼ in.

Sundstrand Model A-2 Oil Burner

Model A-2 of the line of oil burners manufactured by the Sundstrand Engineering Co., Rockford, Ill., is equipped with an air compressor in order that the proper amount of air can be mixed with the oil. The regulation of pressures in this burner is from 5 to 8 lbs. of oil pressures to 8 lbs. of air pressure. The mixture of oil and air takes place before leaving the nozzle.

In this model, designed especially for small installations, the secondary air is introduced into the fire bowl, and the mixture of primary air and oil is introduced above the bowl. The flame is forced down into the bowl where, after mixing with the secondary air, the combustion of the heavier gases takes place.

The burner is fully automatic in operation and equipped with oil, ignition and flame safetys. The oil safety switch stops the burner as soon as a small quantity of oil collects in the bowl. The burner is designed for installations having 800 sq. ft. of radiation or less.

Arco Packless Water Valve

Arco Packless No. 901 water valve has been announced by the American Radiator Co., New York. This valve combines the packless principle with the swinging plate and equalizing features embodied in the No. 101 valve.

The swinging plate insures perfect operation, as the sharp edges cut away the corrosion or sediment and keep the valve clean.

An adjustable stop with an indicator provides means for balancing the job. Permanent adjustment after installation, equalizes the flow regardless of radiator or pipe sizes. The handle is of unbreakable composition. The valve opens with a half turn and is made leakproof by specially molded rings with a metal core, held under compression by a heavy spring.

Room Cooler Announced by Frigidaire

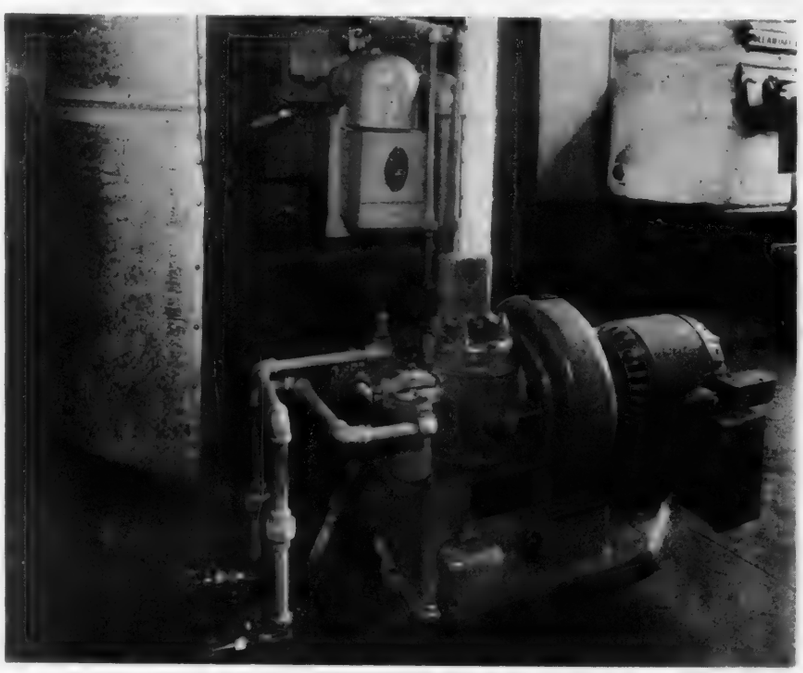
A room cooling unit for use in homes and offices has been announced by the Frigidaire Corp., subsidiary of General Motors Corp., Dayton, O. A specially designed fan draws air in at the bottom, passes it over a large Frigidaire cooling

Frigidaire Room Cooling Unit

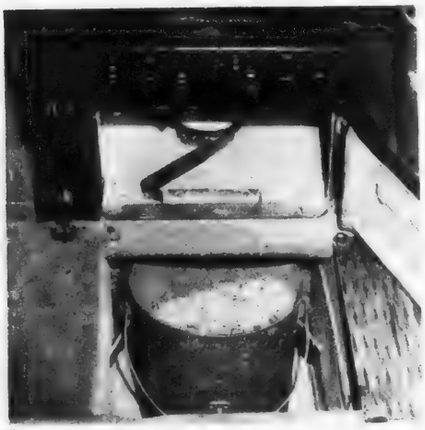
coil and then forces it out into the room at the rate of 450 cu. ft. per min. In this way, the air, to a height of several feet above the floor, is cooled, dried and circulated without producing annoying drafts.

The cooling coil is refrigerated by a standard Frigidaire compressor, which can be placed in the basement or in any other convenient location remote from the cooler. In tests this cooler has lowered the temperature of an average-sized room 10° in 30 min. At the same time the humidity was decreased 10%. Tests were conducted in a room having a temperature of 90°.

Finished in gray Duco, this cabinet has a height of 48¾ in., a width of 27¾ in. and a depth of 16 in.



Sundstrand Model A-2 Oil Burner



Patents Pending

Ash Can in Place with Floor Plate Moved Aside, Ash Uplifter

Ash Removing Device

A device making possible the easy and definite removal of ashes has been announced by the Ash Uplifting Co., Scranton, Pa. With this device the regular ash can used in most homes is placed on the elevator and lowered into the specially constructed pit under the heater. Whenever the fire requires shaking, the ashes are deposited in the can which can quickly be raised by a few turns of the elevator handle until it is on a level with the cellar floor. The entire operation of raising a full can of ashes, moving the can from the elevator, and lowering the empty can in place, requires about 3 min. The machine is easy to operate.

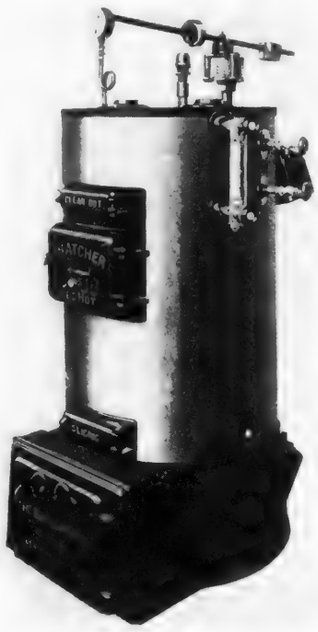
Broomell Modulating Radiator Valve

A sliding-sleeve modulating radiator valve for vapor, vacuum or steam systems, with pressures up to 20 lbs., has been placed on the market by the Vapor Heating Co., York, Pa. In this valve the fixed seat is formed by a removable stationary sleeve so that it is unnecessary to replace the entire valve when the seat becomes worn. In case of repairs or replacements, it is not necessary to remove the valve from the radiator. The top is loosened from the body and all of the component parts of the valve can be lifted out, the top serving to locate and secure the interior parts of the valve. No packing is required, the stem being equipped with a tapered collar which is fitted and ground into, and works in a recess formed by, the juncture of the adjusting nut and the sliding sleeve. When the seat of the sliding sleeve is raised tight against the seat of the stationary sleeve, the tapered collar of the stem is tight against the ground seat of the adjusting nut, preventing the steam from escaping around the stem, and holding a vacuum in the system.

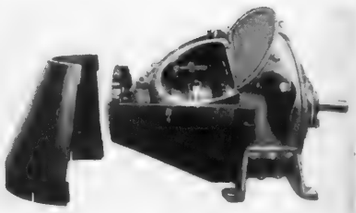
The valve is available in three sizes, ½ in., ¾ in. and 1 in.

Thatcher "Red Hot" Boiler

A new Thatcher boiler for use in "modern cellars" has been placed on the market by the Thatcher Co., 3141 St. Francis St., Newark, N. J., under the name of "Red Hot." It has a bright red enamel-finished jacket and is adaptable for coal, gas or oil fuel. The "Red Hot" boiler is cast in one piece and has an extension front ash-pit to accommodate an oil burner. Its fuel and dome construction is a modification of the Thatcher "staggered fire-travel" design. A layer of asbestocel fits against the jacket and provides the necessary insulation.



Thatcher "Red Hot" Round Jacketed Boiler



Fan-Cooled Type SK Motor

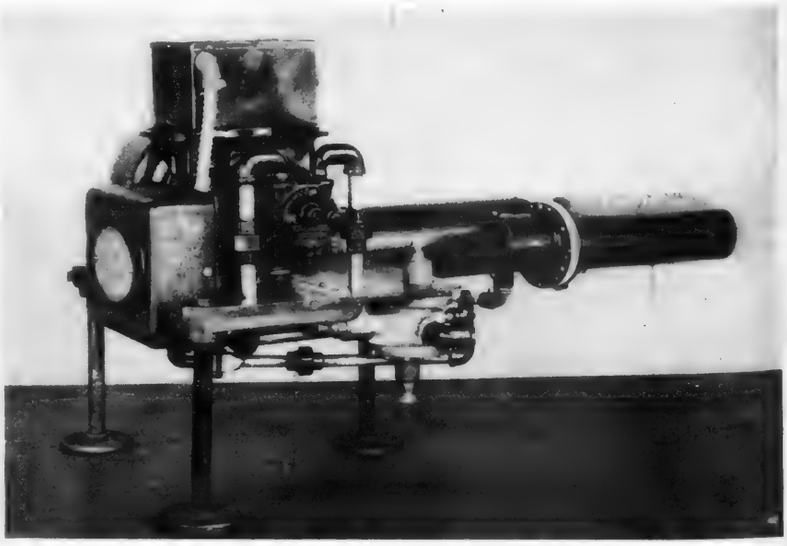
Dust-Proof Fan-Cooled Motor

A totally-enclosed fan-cooled motor for direct-current applications is announced by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. All mechanical parts of the motor, with the exception of the shaft, are interchangeable with those parts used on the present totally-enclosed motor of the same frame size. Also, the essential mounting dimensions of the new type motor are the same as those on the standard open-type SK motor of the same frame size.

Nu-Way Oil Burner

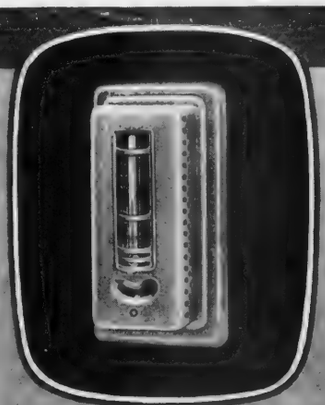
Model 35, designed to carry loads from 1250 sq. ft. to 3000 sq. ft. of direct radiation, has been announced by The Nu-Way Corp., Rock Island, Ill. This burner is built in a single unit; the combustion controls and pump, formerly made in two separate parts, are now combined.

This model is a high-pressure type and operates on any grade of fuel oil from 28°-30° gravity. The flame is projected into the fire box at a low velocity to reduce the noise of combustion. Air in the fuel oil is eliminated and the oil forced at high pressure through a specially-designed nozzle. Oil delivery is accomplished by one pump connected directly to the motor shaft. This pump serves the double purpose of pumping oil from the supply tank and maintaining the proper pressure for combustion.



Model 35 Nu-Way Oil Burner

BOSTON CONSOLIDATED GAS COMPANY BUILDING
BOSTON, MASSACHUSETTS
PARKER, THOMAS & RICE, *Architects*, Boston, Mass.
HOLLIS FRENCH & ALLEN HUBBARD, *Engineers*, Boston, Mass.
H. E. WHITTEN CO., *Heating Contractors*, Boston, Mass.



The Powers Type D Thermostat

Does not need to be adjusted or overhauled annually. Often gives 15 to 20 years of accurate control without repairs of any kind. Gives true GRADUATED control. Uses only 10% of compressed air required by other thermostats. Costs more. It's worth more!

"We will have a POWERS *system and nothing else"*

Intelligent buyers of temperature control want SERVICE built into the apparatus they buy. They know the folly of buying a cheap system of temperature control and being annoyed later with the trouble and expense of service calls.

More than the usual amount of investigation of Temperature Control was made by the owners of the building shown at the left, before they insisted:

"We will have a* POWERS *System, and nothing else!"

***Why?*— because its greater dependability and long service without repairs or adjustments insures the maximum return on the investment.**

We build SERVICE into Powers Control. Its first cost is usually higher, but it always costs much less in the end.

THE POWERS REGULATOR COMPANY
35 Years of Specialization in Temperature Control
CHICAGO: 2718 Greenview Avenue
NEW YORK CITY: 137 East 46th St.
Offices in 35 Other Cities
The Canadian Powers Regulator Co., Ltd.
Toronto, Ont.

POWERS

New Trade Publications

The Better Way is the title of a booklet received from Reif-Rexoil, Inc., Buffalo, N. Y. Advantages accruing to the home-owner who uses oil fuel are attractively and graphically outlined, followed by figures and charts showing comparative seasonal fuel costs, when burning oil, coal, natural or artificial gas. Photographs and descriptions of the different kinds of controls used with this burner are included.

Heat With the Comet Gas Radiator is the caption on a folder published by the Comet Radiator Corp., 2010 Market St., Philadelphia, Pa. Comet gas radiators are manufactured in 13 sizes 26-in. high, the steam ratings ranging from 26 sq. ft. to 104 sq. ft. They can be used wherever individual radiators are advantageous

Comet Gas-Fired Steam Radiator

and can be thermostatically controlled. The manufacturer especially recommends them for apartments, churches, factories, garages and stores.

Wing Featherweight Unit Heaters are brought to the attention of the industry in a new catalog issued by the L. J. Wing Mfg. Co., 154 West 14th St., New York. Various mountings of motor and heating units in relation to the requirements to insure equal distribution of heat for all types of buildings are given a prominent place in the catalog. Two main types (H.C. and L.C.) are made by the company. Type L.C. fan and motor are below the heating element. Cold air is drawn down through the unit and ejected through a four-way discharge.

Standard discharges are available in eight types. Adjustable diffusers are standard in all types to permit the adaptation of the unit to the particular installation. While not incorporated in the system, thermostatic control is available. A mercoid thermostat accurate to 2° operates directly in the circuit. With a steam pressure of 5 lbs. and temperature of 227°, units are available utilizing 1.72 to 18.8 boiler horsepower, supplying from 1150 to 1900 cu. ft. of air per min., or an equivalent B.T.U. per hour of from 52,000 to 623,000.

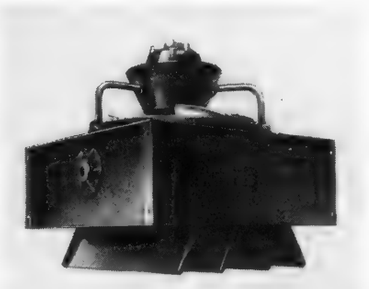
Humidity with Zephyr Air is discussed in a booklet issued by the Zephyr Washed Air Co., 1124 Harmon Place, Minneapolis, Minn., featuring particularly the application of Zephyr washed air installations in industrial plants, offices, hospitals, cigar stores, printing plants and the like. A prominent place in the booklet is given to Model 6 Zephyr for side-wall installation with the main feed and drain pipe run horizontally parallel to the wall, directly below the Zephyrs. Air is discharged from the lower register at a velocity ranging from 200 to 300 ft. per min., depending upon the water pressure.

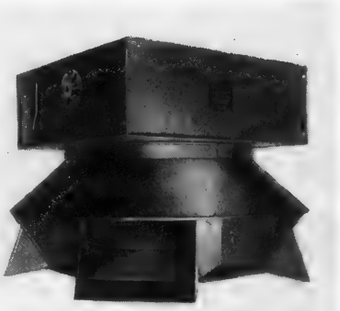
This particular model is listed to evaporate from 10 to 15 gal. of water per day, where connections are made to warm water, a capacity sufficient to maintain an average relative humidity of 40% or more in a space of from 10,000 to 12,000 cu. ft. In the operation of the

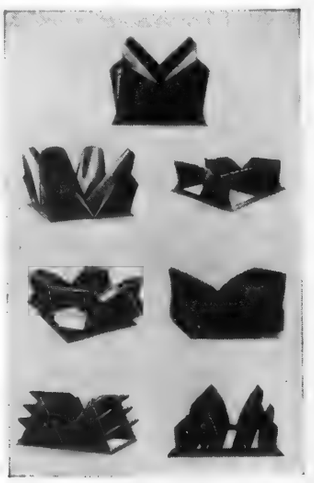
Zephyr Air Washer

Zephyr washed air system, filtered water passes and is discharged downward from two spray nozzles. This downward misty spray fills the cabinet, creating a suction or vacuum which draws in the air and produces circulation.

For ceiling installation, the company manufactures the Model 20 Zephyr. Still another type described is the Model 10 Zephyr for side-wall installation in private offices, reception rooms, cigar humidors and small work rooms, where the cubical content of the room does not exceed 8000 cu. ft. Size 8¼ in. x 11 in. Pp. 24.







Standard Discharges for Wing Unit Heaters

(Upper left) Type LC Wing Featherweight Unit Heater

(Lower left) Type HC Wing Featherweight Unit Heater

Going big Getting bigger

Eighteen months ago we took over the six year old Hart Oil Burner and factory. What have we done in this year and a half? These, we honestly believe, are outstanding accomplishments:

Made good profits for the most enthusiastic, best satisfied, fastest growing oil burner dealer organization in the country today.

Whipped into shape an energetic sales force unequalled in the intelligent service and sales help it renders dealers and distributors.

Refined the design of our four model D's to make them even more readily salable than they were before.

Designed, built, marketed and installed hundreds of smaller model D-O's in warm air furnaces.

Designed, field tested and built four model M's for industrial installations.

Perfected and refined all models to a point where installation costs and dealer service are the lowest in the industry.

Originated and put into effect new sales making plans that have moved Preferred-Hart Oil Burners off dealers' floors with a rapidity never before experienced.

In this year and a half there has come to us, unsolicited, a great many of the foremost distributors and well known dealers in the country—men realizing that in the Preferred-Hart line, in our franchise and in our organization—they can get their ideal of a burner line, contract and business associates.

Hardly a week goes by without some successful oil burner dealer organization asking for the HART franchise. Yet very few of these are accepted. Where we have dealers we prefer to work with our old HART dealers, helping them to success—a square dealer policy.

You may be interested in joining us. We can offer you ten perfected models to meet every installation demand from warm air furnaces to 150 h. p. boilers. HARTS are sold to you on a small factory profit basis—discounts that eliminate over-buying in order to get favorable prices—exclusive territory—special sales helps based on the successful retailing experiences of the officials of this company—and judging from dealers' comments the fairest selling agreement ever written for the retail burner business.

If warm, friendly, human, sincere co-operation means anything, plus a complete burner line that is as competition-proof as it is possible to build—then we will hear from you.

If your territory is open, and you have a record of success, we know we can help you make real money.

"The Business of Selling HART Oil Heat" is a brief sales manual with proved ways of closing orders. No matter what kind of an oil burner line you sell, you are invited to read this book. Write for your copy before the limited supply is exhausted.

MEMBER OIL HEATING INSTITUTE OIL HEAT AS DISTRIBUTED AT RESIDENCE

PREFERRED OIL BURNERS, INC.

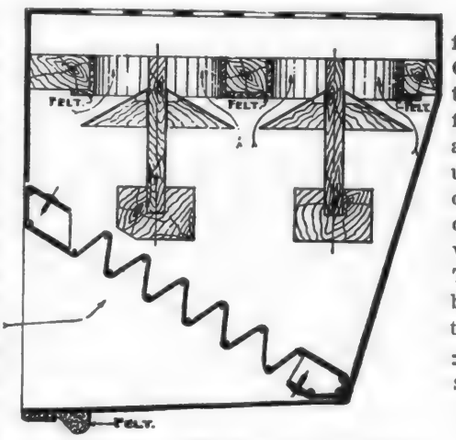
Peoria, Illinois

HART OIL HEAT

Clow Gasteam Heating Systems, a handbook for architects and heating engineers, has been received from James B. Clow & Sons, Chicago, Ill. This book, which conforms to A.I.A. file specifications, is not only the most complete book on this subject that has been published, but the material is attractively presented.

Capacity tables for the various sizes of radiators are followed by installation specifications and instructions, including tables showing the capacity of gas pipe computed in square feet of gas steam radiation. Drawings and dimensions are given for the various methods and connections used in running vent pipes. Typical layouts are shown of mechanical vent systems and also for gas steam radiators combined for central heating. A layout of an installation of these radiators in connection with mechanical ventilation is included. Methods of calculating steam radiation requirements are described and contain samples worked out for rooms shown in accompanying plans. Size 8½-in. x 11-in. Pp. 44.

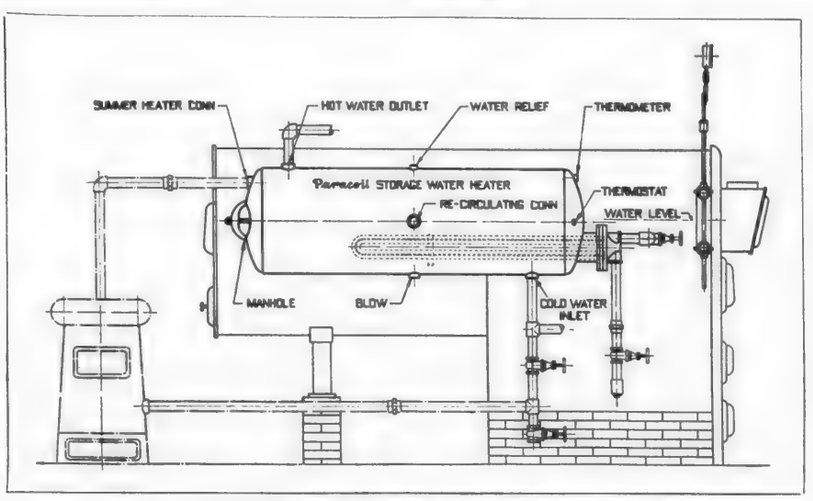
Paracoil Storage Water Heaters are described in a folder brought out by the Davis Engineering Corp., 90 West St., New York. They are designed for below-the-water-line service. Seamless copper tubing bent to U-shape with both ends of each tube expanded into a steel tube sheet constitute the heating elements. Freedom from expansion and contraction strains, due to changes in temperature, is obtained with this method. Head for boiler circulating connections is of close-grain grey cast-iron bolted to the tube-sheet and tank-element flange. A tube sheet and ring construction supports the heating tubes within the tank. Withdrawal of the element is possible without entering the tank. Installation details of Paracoil heaters of the storage type and of the V-type installed below the water-line of a steam boiler, in one case, and, in the other, using steam in the coils, are described in another folder issued by the company.



Cross Section of Siefken Air Controller and Filtering Machine

Siefken "Slow-Motion" Ventilation is featured in a bulletin issued by Air Control Ventilation, Inc., 500 East 20th St., New York. The Siefken air controller and filtering machine consist of a box-like device which fits under the window with an opening to the outside, and contains disc-shaped, differently weighted, floating valve units, so designed that they float upward in proportion to the varying wind or cold air pressure on the outside of the building. These valves close the openings above when the pressure increases, thus maintaining at all times a uniform quantity of incoming air. These air controllers are constructed in many sizes, depending on the capacity of air desired, type of glass used in the window, the type of wall construction and the relative position of the radiator in the room. A grille is placed in the top of the casing so that the casing itself acts as a windowsill.

Milvaco Heating Specialties are featured in a new set of bulletins issued by the Milwaukee Valve Co., Milwaukee, Wis., and brought together in a loose leaf cover. They feature the Milvaco direct return trap, thermostatic trap, packless radiator valves, return trap, drip trap, drip and blast trap, and other specialties.



Layout of Paracoil Storage Water Heater Installation

Comfortable Homes is the title of a folder received from the D. & T. Mfg. Co., St. Louis, Mo. Advantages of electric temperature regulations for coal-fired boilers and furnaces are outlined and the J. M. electric temperature regulators described. The regulator is operated by an electric motor and is controlled from a room thermostat which automatically adjusts the drafts. Thermostat and necessary wires, chains, blocks and pulleys are included with the temperature regulator.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, OF THE HEATING AND VENTILATING MAGAZINE, published monthly at New York, N. Y., for April 1, 1929.

State of New York, County of New York, ss.:

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Howard Myers, who, having been duly sworn according to law, deposes and says that he is the Business Manager of The Heating and Ventilating Magazine, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, National Trade Journals, Inc., 521 Fifth Ave., New York.

Editor, A. S. Armagnac, 521 Fifth Ave., New York.

Managing Editor, none.

Business Manager, Howard Myers, 521 Fifth Ave., New York.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)

National Trade Journals, Inc., 521 Fifth Ave., New York; Charles L. Bowes, care of A. D. Ranstead, 327 No. Menard St., Chicago, Ill.; Joseph E. Browne, 521 Fifth Ave., New York; Goldman, Sachs & Co., 30 Pine St., New York; F. B. Keech & Co., 52 Broadway, New York; Miss Rosalie Onorato, care of J. L. Onorato, 836 Union St., New Orleans, La.; Pearl & Co., 71 Broadway, New York; H. J. Redfield, 521 Fifth Ave., New York; John T. Wilson, 521 Fifth Ave., New York; Rupert T. Zickl, care of Bond & Goodwin, Inc., 31 Pine St., New York.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are:

None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

HOWARD MYERS, Business Manager.

Sworn to and subscribed before me this 8th day of April, 1929.

MADELINE DIETRICH.

Notary Public, Bronx County.
(Commission expires March 30, 1931.)
Bronx County Clerk's No. 35.
New York County Clerk's No. 135.
Register's No. 1D164.

The simple way to equalize *forced* hot water heating

GRINNELL, master builder of heating, industrial, and power piping and fittings, backs this revolutionary development in *forced* hot water heating.

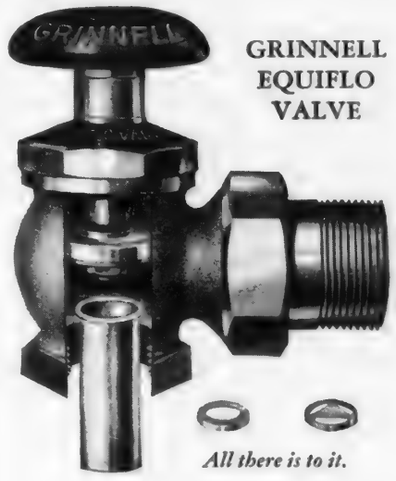
Equiflo Valves permit easy calculation of pipe sizes by simple tables similar to the tables commonly used in vacuum steam systems.

They make radiator and piping changes possible *without recalculation of sizes.*

They serve as the regular shut-off valve for each radiator.

Grinnell Equiflo Valves are specially suitable for hospitals and other institutions; for offices and large residences; on any job where *forced* hot water heat has proved its superiority.

Study the variety of jobs represented in the following installations.



GRINNELL EQUIFLO VALVE

All there is to it.

The proved way to simpler *forced* hot water systems

Only Equiflo Valves can give you

1. *Equalized* circulation of water *at all temperatures.*
2. Simplified design.
3. Cheaper first cost.
4. Lower operating costs.
5. A regular shut-off valve for each radiator.
6. A modernized *forced* hot water system. Equiflo Valves are quickly installed on existing systems.

A Few Prominent Equiflo Valve Installations

INSTALLATIONS	LOCATION	ENGINEERS
Walter Reed Hospital	*Washington, D. C.*	U. S. Government (War Dept.)
Goes Lithographing Co.	*Chicago, Ill.*	Schmidt, Garden & Erickson Co.
Packard Motor Car Co.	*Detroit, Mich.*	Sessions Engineering Co.
Girard College—2 jobs	*Philadelphia, Pa.*	Day & Zimmerman Eng. & Const. Co.
Summit County Childrens' Home	*Akron, Ohio*	Geo. S. Rider Co.
St. Marys of the Springs Academy	*Columbus, Ohio*	J. G. Adams
Governors Island Barracks	*New York*	U. S. Government (War Dept.)
W.S.A.I. Broadcasting Station	*Mason, Ohio*	Henry Niemes, Inc.
D. C. Wilson Residence	*Oakland County, Mich.*	Newell J. Hill
Washington Cathedral	*Washington, D. C.*	Frohman-Robb & Little
Test Garage	*Indianapolis, Ind.*	Hayes Bros., Inc.
Tobacco By-Products & Chemical Co.	*Louisville, Ky.*	J. E. Sirrine Co.
Gears &, Forgings Co.	*Cleveland, Ohio*	Carter & Richards

Write for architects' and engineers' data book in blue-print form.
Address Grinnell Co., Inc., 208W. Exchange St., Providence, R. I.

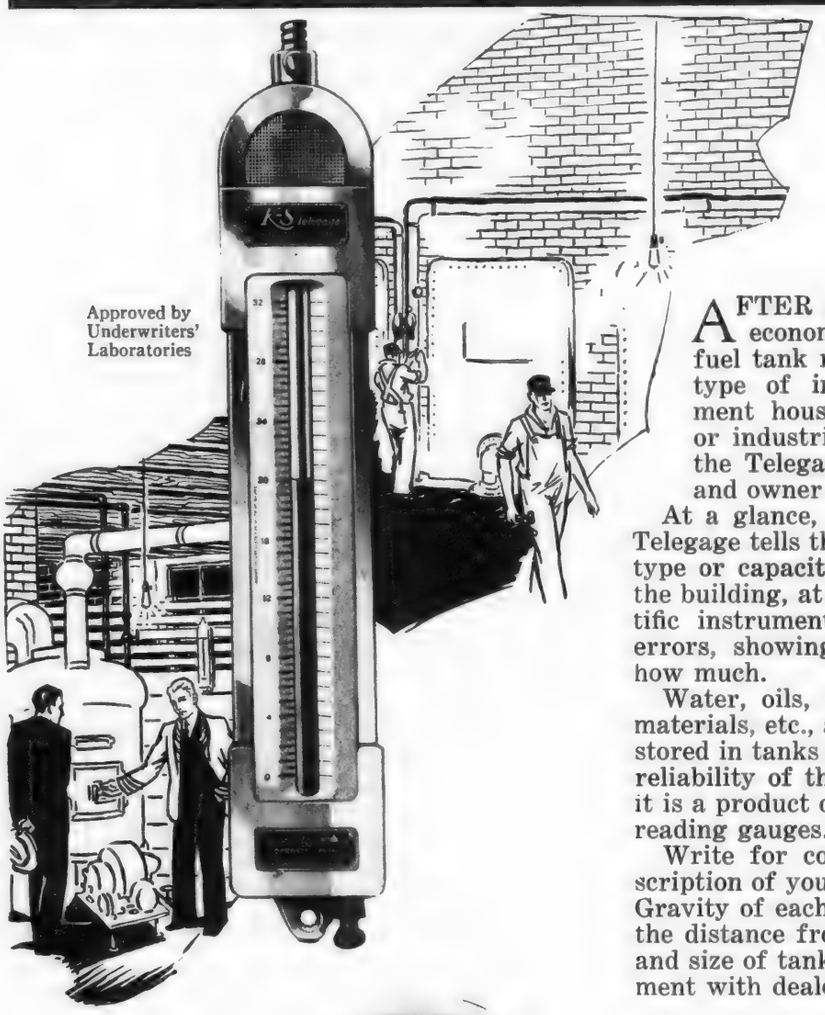
Equalized circulation guaranteed in either new or remodeled systems

GRINNELL COMPANY

Executive Office, Providence, R. I. *Branches in all Principal Cities*

Pipe Hangers **Pipe Fittings** **Fabricated Piping** **Thermolier** (*The copper unit heater*)

THE HYDROSTATIC DISTANT READING GAUGE



Approved by Underwriters' Laboratories

Is the Oil Burner Installation *Complete?*

AFTER all, today's oil burner is efficient and economical up until the moment a neglected fuel tank runs dry. Fuel failure is costly in any type of installation—in private homes, apartment houses, hotels, hospitals, public buildings or industrial plants. By guarding the fuel tank, the Telegage protects both the heating engineer and owner against this serious difficulty.

At a glance, with ease and dependability, the K-S Telegage tells the depth of fuel in storage tanks of any type or capacity. Placed conveniently in any part of the building, at any distance from the tank, this scientific instrument guards the fuel oil supply against errors, showing when a new supply is needed, and how much.

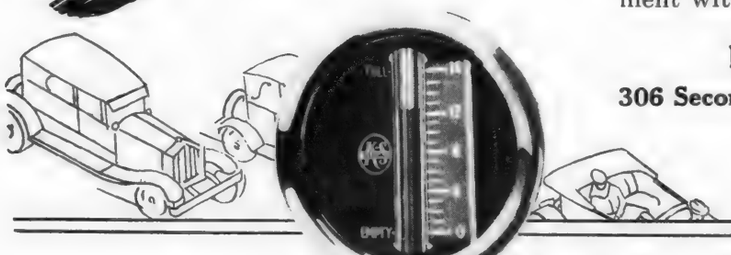
Water, oils, chemicals, gasoline, fuel oil, finishing materials, etc., are a few of the many industrial fluids stored in tanks and guarded by the K-S Telegage. The reliability of the Telegage is assured by the fact that it is a product of the world's largest maker of distant-reading gauges.

Write for complete information, giving a full description of your requirements—the Baume or Specific Gravity of each fuel or other liquid to be measured—the distance from tank to desired location of gauge—and size of tank. Information concerning our arrangement with dealers sent on request.

KING-SEELEY CORPORATION

306 Second Street **Ann Arbor, Michigan**

Branch Offices:
New York—44 Murray Street
Chicago—472 Wrigley Building



The K-S Telegage

BE CERTAIN WITH THE *K—S TELEGAGE*

Standard factory equipment on three-fourths of all cars selling for $700 or more.

What's the Difference?
It's *PERFORMANCE!*

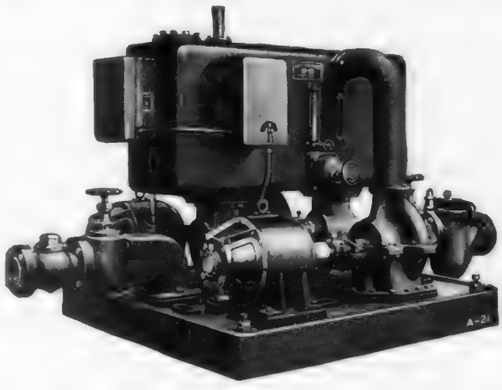
▲ ▲ ▲ ▲ Today, it's reasonable to assume that every manufacturer is producing an article possessing merit and "talking points."

The buyer naturally asks, then, "What's the difference?"

It's PERFORMANCE—Performance that is engineered and *built into* the product.

Performance has placed the AMES PUMP where it is today. Its daily, dependable service on jobs the world over is making the AMES

The Pump of Performance



At any of these AMES Sales Offices there is Complete Information on *Pump Performance* for YOUR Needs

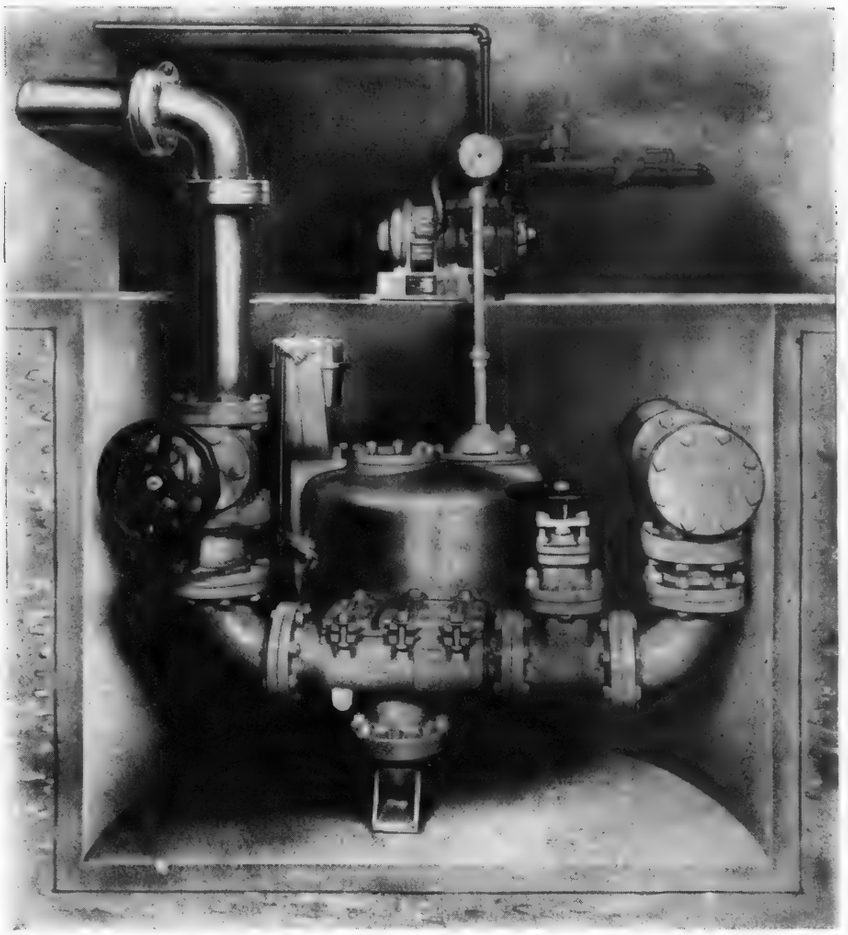
Atlanta, Ga.	Columbus, Ohio	Kansas City, Mo.	New Orleans, La.	St. Louis, Mo.
Birmingham, Ala.	Cincinnati, Ohio	Little Rock, Ark.	New York, N.Y.	St. Paul, Minn.
Boston, Mass.	Detroit, Mich.	Los Angeles, Calif.	Newark, N.J.	San Francisco, Calif.
Buffalo, N.Y.	Fort Dodge, Iowa	Memphis, Tenn.	Oklahoma City, Okla.	Seattle, Wash.
Charlotte, N.C.	Fort Worth, Texas	Milwaukee, Wis.	Philadelphia, Pa.	Shreveport, La.
Chicago, Ill.	Indianapolis, Ind.	New London, Conn.	Pittsburgh, Pa.	South Bend, Ind.
Cleveland, Ohio	Jackson, Miss.		Portland, Ore.	Vancouver, B.C.

London, England Tokio, Japan

AMES PUMP COMPANY, INC.

30 Church Street - New York City

PERFORMANCE DISTINCTIVELY DIFFERENT



This small Jennings Sewage Ejector has a capacity of 30 g.p.m.—sufficient to serve five toilets. Other sizes range in capacity from 50 to 1500 g.p.m. with heads up to 50 ft.

Handles anything—

that will pass through a 4" pipe

Unscreened sewage—garbage—grease drainage — no matter what it is that must be moved, the 30-gallon Jennings Sewage Ejector affords a low cost unit that will do the job.

Simple in construction, operating on the pneumatic principle, the Jennings Ejector does away with air valves, air storage tanks and reciprocating compressors. No screenage is provided since no working parts come in contact with the material pumped. Anything that will enter through the 4-in. inlet pipe is readily handled.

The Jennings Ejector is easily installed in basements of apartment houses, hotels, hospitals, office and other public buildings where toilets or house drains are below street sewer level. The receiving pot may be placed in a pit in any out-of-the-way corner.

Jennings Pumps

THE NASH ENGINEERING CO 81 WILSON ROAD, SOUTH NORWALK CONN.

Trade and Miscellaneous Notes

Coming Events

May 13-16, 1929. Annual meeting of National Fire Protection Association in Memphis. Headquarters at Hotel Peabody.

June 10-13, 1929. Fortieth annual convention of the Heating and Piping Contractors National Association in St. Louis. Headquarters at the New Jefferson Hotel.

June 11-14, 1929. Twentieth annual convention of the National District Heating Association in Detroit.

June 24-28, 1929. Midsummer meeting of the American Society of Heating and Ventilating Engineers at Lake of Bays, Ont., Can. Headquarters at Bigwin Inn.

October 14-18, 1929. Eleventh annual convention of the American Gas Association at Atlantic City, N. J. Headquarters at Municipal Auditorium.

Management Committee for American Radiator Company

Following the resignation of Andre Mertzanoff, general manager and vice-president of the American Radiator Company, a rearrangement has been effected whereby the operation of the company will be lodged in the hands of a management committee, consisting of the following company officials: Roy Hamilton, secretary, to be chairman; Adams Geddies, manager of manufacturing; Joseph Beirn, general sales manager, and D. M. Forgan, treasurer.

W. H. Carrier to Attend World Engineering Congress in Tokio

Among the American engineers who will attend the World Engineering Congress in Tokio, Japan, the latter part of October, is W. H. Carrier, president of the Carrier Engineering Corp., Newark, N. J. He will be accompanied by Mrs. Carrier. Mr. Carrier will present a paper at the congress, on behalf of the American Society of Heating and Ventilating Engineers, on the subject of "Control of Humidity and Temperature as Applied to Manufacturing Processes and Human Comfort."

It was Mr. Carrier's original intention to make a trip around the world, visiting India, where offices of the Carrier Engineering Corporation are located, and associate companies in Europe. He will return direct from Tokio, the latter part of November.

Pipe and Supplies Association Will Convene in Pittsburgh

The twentieth annual convention of the National Pipe and Supplies Association will be held at the William Penn Hotel, Pittsburgh, May 13-15. Papers dealing with the different branches of the association's activities will be read as follows: Steel pipe, C. F. Cruciger, general sales manager, Spang Chalfant Company; iron pipe, H. F. Mattern, general sales manager, Reading Iron Company; enamel ware, Robert E. Sargent, general sales manager, Standard Sanitary Mfg. Company; plumbers' brass goods, Harry Speakman, Speakman Company; valves, William H. Utz, general manager of sales, Jenkins Bros.; fittings, Herbert W. Seymour, general sales manager, Crane Company; pottery, A. M. Maddock, Thomas Maddock's Sons Co.; boilers and radiation, W. M. Cosgrove, vice-president, American Radiator Company; soil pipe, William M. Byrd, Jr., vice-president and general sales manager, Alabama Pipe Company.

All of the third day will be devoted to a trade practice conference, under the auspices of the Federal Trade Commission, to be conducted by Commissioner Charles H. March, assisted by Hon. M. Markham Flannery.

J. I. Lyle on European Trip

Mr. and Mrs. J. I. Lyle and their daughter sailed April 24 on the Berengaria for a two months' stay in Europe. Mr. Lyle, who is treasurer and general manager of the Carrier Engineering Corp., Newark, N. J., will combine business with pleasure by visiting the London office of the company, as well as France, Switzerland, Holland, Italy and Belgium. He will sail for home June 15.

Surface Combustion Company Purchases Webster Engineering

The Surface Combustion Co., of Toledo, O., has announced the purchase of the Webster Engineering Co., Tulsa, Okla. The purchase company has been well known for the past few years as the maker of an efficient and simple low-pressure radiant gas burner for application in power boilers and heating boilers for large buildings. The burners can be applied to any commercial boiler or furnace installation without changes in the boiler setting.

Offices and shops of the Webster Engineering Company will be maintained at Tulsa and will be operated as a division of the Surface Combustion Company.

Inaugurates Centrifugal "Pump School"

Following the example of a number of progressive corporations, the Chicago Pump Co., Chicago, Ill., has inaugurated a school of instruction in the manufacture and merchandising of electric centrifugal pumps. The students are new representatives and representative's salesmen. Among the subjects covered are details of production, application of pumps and information necessary to figure a pump job properly. The production program calls for work in the machine shops, assembly floor, and in the switch, testing and service departments. Considerable time is spent by the student with expert estimators.

All new members of the company will be asked to go through the pump school. Those who have already completed the course are Sidney Steiner, of the company's New York office, and W. K. Hornbuckle, the company's new representative in Memphis. Raymond Thethaway, one of the company's other representatives, is winding up his special course with the Chicago Architect's Engineering Service Department, preparatory to his cooperating with architects and engineers in Detroit.

Miscellaneous Notes

March building operations as reported by the F. W. Dodge Corporation, show an increase of 34% over the total for February of this year, but a decrease of 18% from the total for March, 1928. The total figures for the 37 states east of the Rocky Mountains were $484,847,500. Analysis of this record shows that 41% of all construction was for residential buildings, 16% for commercial buildings, 15% for public works and utilities, and 12% for industrial projects.

Contracts in New York State and Northern New Jersey amounted to $111,539,200. There was a 49% increase over the preceding month, and a decrease of 27% from the total for March of last

year. In the New England States figures amounted to $31,970,300, representing an increase of 21% over the total for February, but showing a decrease of 24% below the total for March of last year.

In the Middle Atlantic States construction contracts amounted to $59,069,200, which showed a 17% increase over February, but a 16% decrease from March of last year. Contracts in the Pittsburgh District amounted to $52,965,900, representing a gain of 6% over the February total and a loss of 31% from the record for March, 1928.

The Central West reports contracts amounting to $159,609,300. These figures show an increase of 61% over the total for February of this year, but a decrease of 9% from the total for March of last year. Figures in the Northwest amounted to $5,494,300, which was almost the same as the amount contracted for during March of last year, but showing a 47% increase over the total for February of this year.

Contracts in the Southeastern States represent a total of $43,262,300, showing a 26% increase over the total for February, 1929, but a 14% decrease from the total for March of last year. In Texas contracts amounted to $20,937,000, representing a decrease of 3% from the total for February, but an increase of 6% over the total for March, 1928.

Certified Building Registry, Chicago, Ill., which is engaged in a movement for the inspection and rating of buildings for owners, builders, buyers and lenders, is inaugurating the formation of an extension council to further the idea. In an appeal to President Hoover, Cylde A. Mann, director of Certified Building Registry, sets out the reason for this service. In a reply from the White House, it was stated that President Hoover would bring the matter to the attention of the Secretary of Commerce.

Foreman National Bank Building, La Salle & Washington Streets, Chicago, which is nearing completion after breaking records for speed in construction, is described as Chicago's first smoke-stackless skyscraper. It is 42 stories in height. The heating of the building has been accomplished by tapping the boilers in the Conway Building, adjoining the new structure. Engineers of the B & F Heating and Ventilating Company and the Phillips, Getschow Company, working under the direction of Graham, Anderson, Probst and White, architects, provided for the necessary changes in the heating plant in the Conway Building, whereby exhaust steam could be passed through an 18-in. steam pipe from the boiler room of the older building to the sub-basement of the Foreman Building. Fifteen miles of pipe are included in the Foreman Building installation.

Clarence M. Woolley, chairman of the board of the American Radiator and Standard Sanitary Corporation, and also chairman of the board of the American Radiator Company, recently was elected to membership on the board of directors of the Johns-Manville Corporation.

Henry B. Gombers, secretary of the Heating and Piping Contractors National Association, who has been granted a three-months' leave of absence by the board of directors of that organization, sailed early in April for Panama. He will be at the Hotel Tivoli, Ancon, C. Z., until May 6, returning to New York on May 13.

Manufacturers' Notes

Heating Systems Corp., 307 Scott St., Joliet, Ill., has been formed to absorb the Heating Systems and Supply Co., of Chicago, which has been engaged in perfecting and developing heating units. The new corporation, in its acquisition of all the patents, patterns and equipment of the former company, will manufacture and merchandise its product in a new plant which is being erected on a three-acre plot in Joliet. Rudolph W. Menk has been elected president and general manager.

The Boiler Engineering Co., Newark, N. J., announces the appointment of the following representatives: H. A. Woodworth Engineering Co., Suite 313, Central National Bank Bldg., St. Louis, Mo., will cover Missouri and Illinois south of Springfield, Decatur, Champaign and Danville. Steam Specialty Sales Co., 5 South Church St., Charlotte, N. C., with H. P. Ackerman, manager, will cover North and South Carolina.

May Oil Burner Corp., Baltimore, Md., has appointed A. L. Coleman, formerly connected with Preferred Oil Burners, Inc., as division engineer for the company at its Chicago office.

Dayton-Dowd Co., Quincy, Ill., has appointed the Corken Pump & Machinery Co., Oklahoma City and Tulsa, as its Oklahoma district representative. The Oklahoma office will be in charge of O. K. Corken and C. M. Corken, and the Tulsa office in charge of W. H. Gransden.

Time-O-Stat Controls Co., Elkhart, Ind., has appointed Time-O-Stat Distributors, 122 South Michigan Ave., Chicago, as exclusive distributor for its products.

Century Engineering Corp., Cedar Rapids, Iowa, announces that the Lattner interests have taken over all the outstanding shares of the common stock. At a meeting of the board of directors the following were elected as officers for the coming year: E. J. Lattner, president, and Joseph A. Lattner, secretary and treasurer. T. P. Rogers and F. W. Darling, formerly president and treasurer, respectively, are no longer connected with the corporation.

Wilcolator Co., Newark, N. J., has appointed Marvin C. Barnum sales manager. Mr. Barnum formerly was connected with the Zephyr Washed Air Co., Minneapolis, Minn., as its sales manager.

Pierce, Butler & Pierce Mfg. Corp., 41 East 42nd St., New York, announces the election of Stanley B. DeLong, formerly general manager of manufacturing, as president to succeed Roger Morton. B. A. McFarland has been appointed general manager of manufacturing to succeed Mr. DeLong.

Fuel Oil Engineering Co., Bethlehem, Pa., has been appointed distributor for 30 counties in middle Pennsylvania, of the products of the Parker Oil Burner Corp., and of the Security Oil Burner Company, both of 1926 Broadway, New York. Branches will be operated by the Fuel Oil Engineering Co., in Harrisburg, Bethlehem and Lebanon, while the remainder of the territory will be covered through dealer representation.

The Bishop & Babcock Sales Co., Cleveland, O., announces the appointment of W. Hawley & Co., 6032 West Fort St., Detroit, Mich., as sales representative in Detroit and Michigan territory, to succeed its former representative, the Wooley Engineering Company.

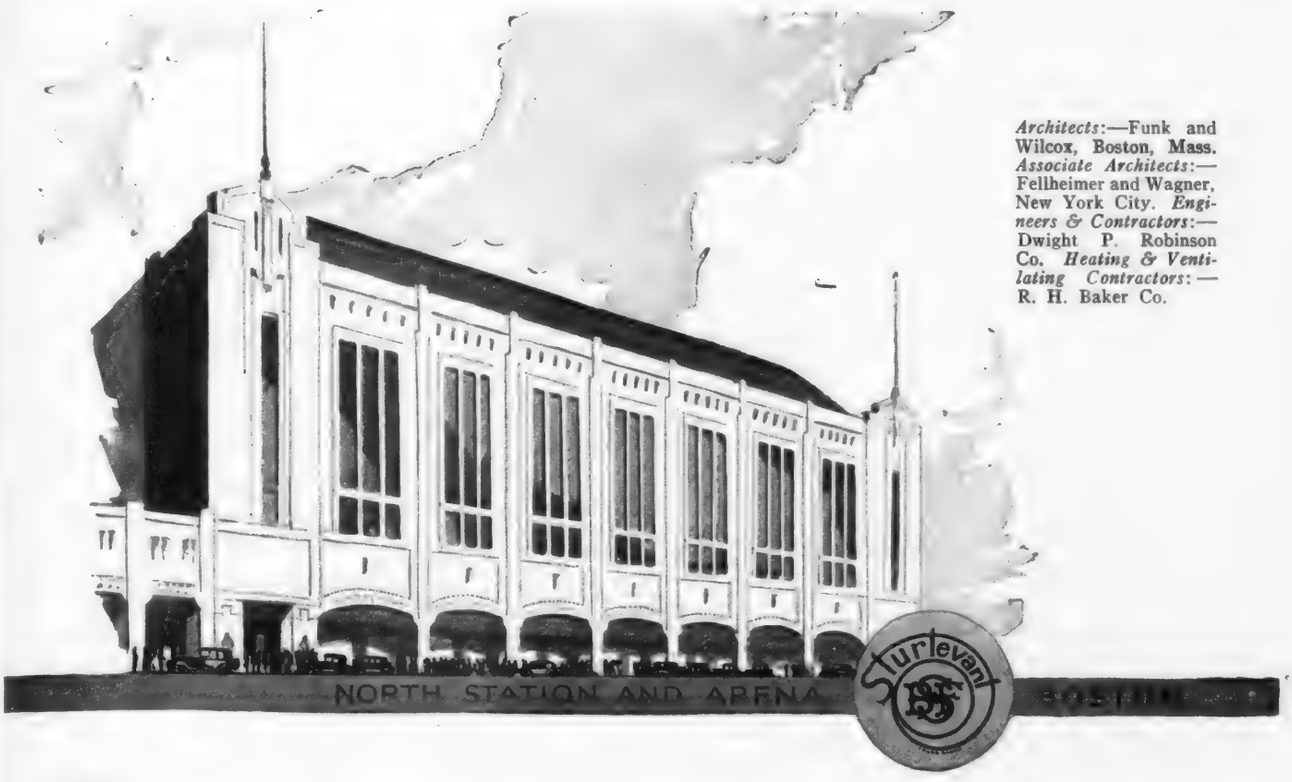
Gorton Heating Corp., 96 Liberty St., New York, has appointed A. C. Sigmon Engineering & Equipment Co., 216 Haywood Bldg., Asheville, N. C., as sales representative for the Gorton single-pipe vapor heating system in North Carolina and Greenville and Spartanburg counties in South Carolina. A. C. Sigmon, a mechanical engineer, formerly was with the City of Asheville, supervising maintenance of mechanical equipment of schools and public buildings.

United States Radiator Corp., Detroit, Mich., has appointed C. M. Baumgardner as Chicago manager. Mr. Baumgardner formerly was manager of the company's St. Louis branch. J. E. Hamilton, formerly manager of the Denver branch, has been made manager at St. Louis to succeed Mr. Baumgardner. D. E. Babcock, formerly office manager at Kansas City, has been appointed manager at Denver, to succeed Mr. Hamilton.

Chicago Pump Co., Chicago, Ill., announces that W. T. Morgan, formerly with Goulds Pumps, Inc., has been assigned to the New York office where he will serve as manager of engineering service.

Change of Address

Alexander Brothers, Inc., 14 South St., Philadelphia, Pa., announces the removal of its Chicago branch to 162-166 North Clinton Street.



Architects:—Funk and Wilcox, Boston, Mass. *Associate Architects*:—Fellheimer and Wagner, New York City. *Engineers & Contractors*:—Dwight P. Robinson Co. *Heating & Ventilating Contractors*:—R. H. Baker Co.

Fanning 18,000 People

in Boston's new "Madison Square Garden"

and ventilating an important terminal at the same time!

THE new North Station and Arena in Boston is an innovation in architecture. It houses the Boston & Maine R. R., with its network of connecting lines and has an arena seating capacity of 18,000. Here you can purchase tickets for a train journey, a hockey match, a flower show or a prize fight.

To keep this huge building healthful and comfortable, 24.5 *tons* of fresh, outdoor air must be circulated every minute. An unfailing and efficient ventilating system is of the utmost importance.

Twenty-three Sturtevant fans keep the whole building air-pure at all times. They provide the same kind of dependable and economical service that made Sturtevant Ventilating Equipment the choice of the engineers of the great Holland Vehicular Tunnel connecting New York and New Jersey; the George A. Posey Tube between Alameda and Oakland, California; the New York Life Building and many other notable projects.

B. F. STURTEVANT CO., *Hyde Park*, BOSTON, MASS.

Plants at: Berkeley, Cal.—Camden, N. J.—Framingham, Mass.—Galt, Ontario. Hyde Park, Mass.—Sturtevant, Wis. Offices in Principal Cities

Sturtevant

REG. U.S. PAT. OFF.

HEATING-VENTILATING AND POWER PLANT EQUIPMENT

Classified Advertising

Advertisements under this heading, $2.00 per inch, payable in advance. A 1-in. advertisement contains 35 words. To secure insertion copy must be received not later than the 20th of the month preceding date of issue.

HEATING AND VENTILATING MAGAZINE—521 5th Ave., New York City.

SALES REPRESENTATIVES WANTED—Consistent with factory expansion, we desire responsible experienced sales representatives or established firm as distributors to handle the "Carbonic Safety System" of Refrigeration.
AMERICAN CARBONIC MACHINERY CO.,
Wisconsin Rapids, Wisconsin.

SALES REPRESENTATIVES WANTED for the Gorton Single Pipe Vapor Heating System, in territories now open. State experience and other lines handled. Communications held confidential. Gorton Heating Corporation, (Manufacturers). Established 1887, 96 Liberty Street, New York.

MANUFACTURER'S REPRESENTATIVE—Manufacturer of complete line of fans, air washers and unit heaters, desires recognized representative on commission basis. Address Box 56, care of Heating and Ventilating Magazine.

WE WANT MANUFACTURERS AGENTS calling on Oil Burner Manufacturers and Dealers, also furnace and boiler manufacturers to handle a product that is a valuable accessory to these sources. Address Box 52, care of The Heating and Ventilating Magazine.

WANTED—Salesmen to sell electric pumps calling on Plumbing and Heating Trade for Western Suburbs of Chicago, South Chicago, Gary, East Chicago, Hammond, Whiting — Whole or part time. WEIL PUMP CO., Chicago.

WANTED.—Graduate engineer with four or five years' comprehensive experience in design of drying and air-conditioning equipment. Experience must cover wide field of industrial applications. Apply by letter stating qualifications, experience in detail, references and salary desired. Address Box 53, care of Heating and Ventilating Magazine.

SALES ENGINEER with executive experience desires salaried position with manufacturer to represent them in Philadelphia territory on steel heating and power boilers or any other heating apparatus. Extensive following among the trade and engineers. Address Box 55, care of Heating and Ventilating Magazine.

HEATING ENGINEER—Graduate M.E., desires change preferably in Philadelphia area. Twelve years' experience including six on complete design of Heating, Ventilating and Plumbing systems on all types of buildings. Also had charge of Field. Address Box 54, care of Heating and Ventilating Magazine.

YOUNG MAN, age 24, is looking for a position. Finished two-year heating course and have had four years' practical experience. Located in Philadelphia. What have you to offer? Address Box 51, care of Heating and Ventilating Magazine.

BIG BUSINESS SAYS!

"Prepare NOW to reap YOUR share in the coming years of great business Prosperity."

HARKEN to this Command, O Ye Shop Owners, Salesmen, Mechanics, and others. Fortunes will be made in these next few years by those who KNOW. Devote this Summer to personal preparation in a technical way for going after the bigger paying jobs—the ones with the larger yearly incomes. Build big with big prosperity; our Engineering Service is at your command. Check the subject you prefer, and mail today—full information is free.

- ☐ Heating and Ventilating Engineering.
- ☐ Special Steam and Water Heating.
- ☐ Scientific Warm Air Heating.
- ☐ Plumbing and Sanitary Engineering.
- ☐ Contracting and Estimating.
- ☐ Mechanical Drafting.

Saint Louis Technical Institute
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The most thorough institution for Technical Home Study to-day.
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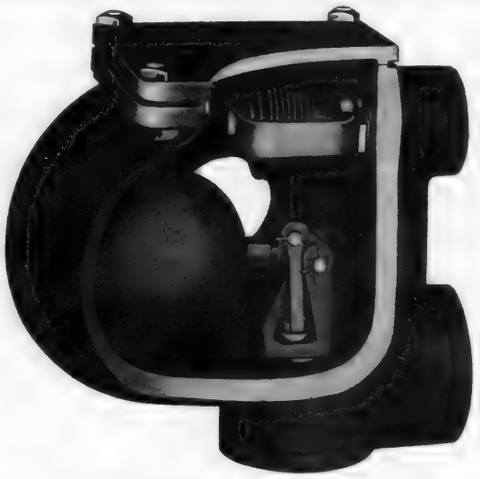


No. 0 THERMOFLEX BLAST AND DRIP TRAP

Especially designed for dripping large supply mains, hot water heaters, unit heaters, etc. A small combination float and thermostatic trap. Self-supporting in the pipe line. Small, compact, and very efficient in operation. Low in cost, high in quality.

Send for Bulletin No. 52 A.

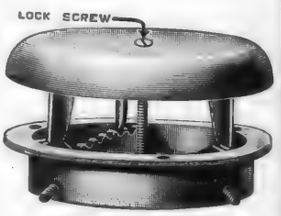
W. D. CASHIN COMPANY
35 HARTFORD ST., BOSTON, MASS.

Nu-Notch
REG U.S. PAT. OFF.
MUSHROOM VENTILATOR

[FOR HIGH EFFICIENCY AND LOW COST]

5 good reasons why you, too, should select "Nu-Notch"

1. **Simple**
   Only floor piece and cap (dome or flat).
2. **Rigid**
   Made of cast-iron recessed notches.
3. **Easy Adjustment**
   From the top in Many Notches.
4. **Quick Installation**
   For any kind of floor.
5. **Capacity**
   Made in 5, 6, 7, 8, 10 inch diameters.



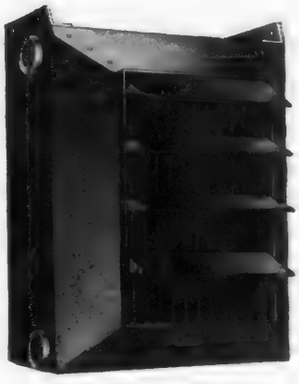
Pat. Aug. 7, 1928

For illustrated booklet, address

KNOWLES MUSHROOM VENTILATOR CO.
202 Franklin St., N. Y. City
Makers of Air Diffusers
Since 1893

The interest which greeted our announcement of new models last month

CONTINUES



New Autovent Unit Heater

Ceiling type. Angles at top provide means of attaching to ceiling or side wall. Other models are provided floor mounting.

The New

AUTOVENT Super Type Heater

means

MORE B.T.U.'S per DOLLAR

Continued interest in our new Super Type Heaters, announced last month, shows a hearty conviction on the part of heating and ventilating men everywhere that each new development tending toward improvement in operation or efficiency should be supported.

Enhanced efficiency is gained in the new Autovent models by both a new type of coil and a sufficient air chamber between fan and coil which renders every heating inch of the latter efficient.

Ease of connecting up these Super Type Heaters is provided by the handy location of supply and return connections.

The ingenious design results also in:—less floor space—shorter piping—no dead air at ceiling — less traps — less roof radiation. Full data on request.

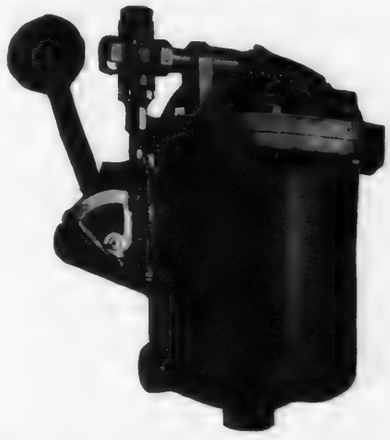
Autovent
Fan & Blower Co.
1805-1827 No. Kostner Ave.
CHICAGO, ILL.

REGISTERED AUTOVENT. TRADE MARK

The

THERMO SYPHON TRAP

—leaves silence on the job as well as safety



WHEN the heating system goes into operation, it is a comfort to building owner, manager and occupant alike to know that noiseless operation is assured by a THERMO SYPHON TRAP.

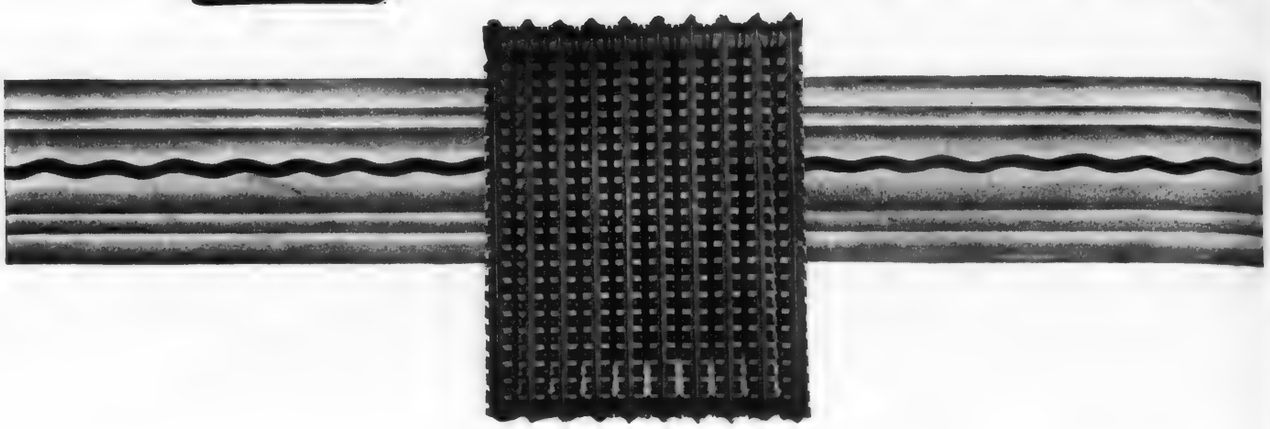
Maintenance of water level, too, by these dependable devices is "Life Extension" for boilers, on all vapor, vacuum, atmospheric, and modulation systems .... on one or two pipe steam systems from less than atmospheric up to twenty pounds pressure.

Send for Bulletin No. 16-HV giving full details. We solicit correspondence on heating difficulties.

HIGH GRADE Return, Vacuum, Lifting and Separating Steam Traps, Reducing Valves, Blow-off Valves.

LYTTON
MANUFACTURING CORPORATION
FRANKLIN, VIRGINIA

2 types of heating



VENTO

CAST IRON HEATERS

FOR twenty-five years, since its introduction, leading Engineers and Architects have enthusiastically endorsed Vento. Today the millions of square feet in successful operation in America's greatest buildings stand as conclusive proof of its complete success. Its record is really remarkable for never has there been one instance of failure.

Vento Heaters are made from high quality, close grained cast iron that will not deteriorate under the action of air gases or water—their life is actually unlimited.

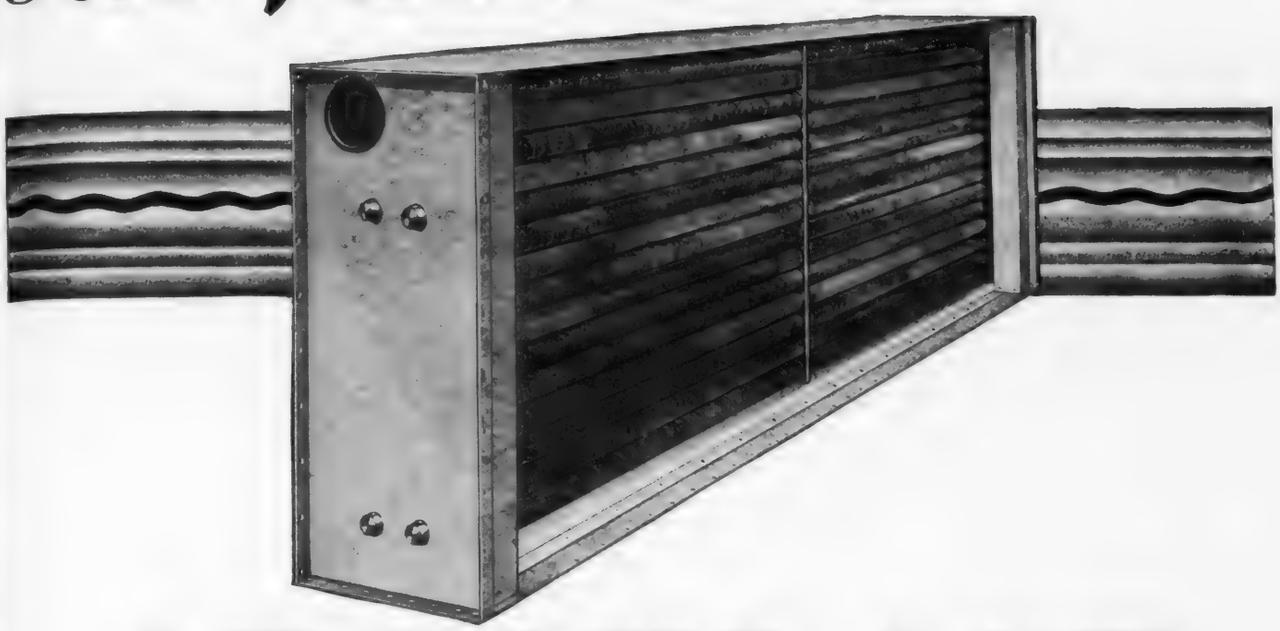
But the outstanding feature of Vento is its design or unique construction which breaks up air currents and insures rapid steam circulation—full heating efficiency from the entire surface of heater.

If you are not familiar with Vento, let us tell you of an installation near you—see it in operation and talk to the engineer.

AMERICAN RADIATOR

816 So. MICH. AVE., CHICAGO—40 W. 40th ST., NEW YORK, N.Y.

indirect surface . . .



ARCOBLAST

ENCASED HEATERS

THIS new light weight surface will appeal to the Engineer and Architect who is figuring heating surface for central fan and plenum chamber work where the pressure range is between 5 and 200 lbs.

The Encased Arcoblast Heater is especially designed for installations where the building construction will not permit the use of the heavier cast iron surface.

Features of the new Encased Arcoblast–

Galvanized Encasement — complete and ready for pipe connections.

No soldered steam backed joints.

Tubes expanded in headers—insured ample strength for high pressures.

Non-Corrosive—heating surface entirely non-ferrous metal.

Assured strength with minimum weight.

The Arcoblast Heater is composed of staggered rows of copper tubes expanded into cast iron headers—on the opposite side of which are registering tapped openings through which the tubes are expanded. After the expanding operation the holes are closed with counter-sunk plugs.

The three-quarter inch copper tubes are fin wound with extended copper surface—metallically attached, with six turns per lineal inch. Their all-over diameter is 1½".

R COMPANY

Branches Everywhere

SEND FOR NEW CATALOGUE

Write today for the new catalog giving complete engineering data.

THE SMALLEST STOREROOM
MAY NOW ENJOY
TWINFAN
HEATING EFFICIENCY

Type V Twinfan installation for small space

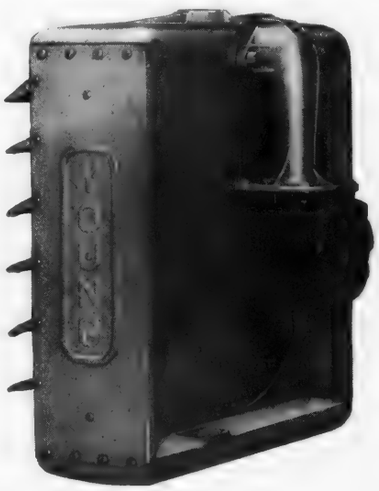
The New Type "V"

Twinfan Unit Heater is exactly like the standard Twinfan Unit Heaters except in size and capacity.

Thus the smallest store may now have the heating advantages and efficiencies heretofore possible only in large heating installations.

Write for descriptive literature and capacity and efficiency tables.

DWYER EQUIPMENT CO.
4534 W. NORTH AVE. CHICAGO, ILL.
HEAT WITH TWINFAN UNIT HEATERS



Efficient

That's the Young Unit Heater exactly —less weight, less noise, less vibration, sturdier construction, longer life, a greater volume of "useful" heated air to the working zone with lower power cost. Our engineers can satisfy you on all these points.

The soundness of Young engineering and construction is proven by the exceptional performance of Young Unit Heaters in major manufacturing plants and is backed by nineteen years of specialization in designing and building heat transfer equipment. Your inquiry will have our prompt attention.

Write for Descriptive Bulletin

Young Unit Heaters

YOUNG RADIATOR COMPANY
Heating Division
RACINE WISCONSIN
Representatives in Principal Cities

Young Quality

© Y. R. Co. UNIT HEATERS
BUILT FOR ENDURANCE AND MAXIMUM PERFORMANCE

James J. Williams, Hupmobile Motor Sales, Rochester, N. Y. Architect and Engineer: S. Firestone, Rochester, N. Y. Heating and Ventilating Contractors: Barebam & Mc Farland, Rochester, N. Y.

Here's a quiet, comfortable salesroom

MAKING the prospective buyer comfortable is one of the fine points of salesmanship. That's why salesrooms, nowadays, are so comfortably furnished, heated, and ventilated.

In the salesroom of James J. Williams, Hupmobile agent in Rochester, four Sturtevant Unit Heater-Ventilators are giving the kind of service that only Unit Heater-Ventilators can give. Heating by recirculation, they quickly warm up the salesroom after it has been left unheated overnight or over the week-end. Not only do they heat much more rapidly than cast-iron, direct radiators . . . they give ten times more heat!

Primarily, however, Sturtevant Unit Heater-Ventilators are used to furnish controlled, draft-free, outdoor air, filtered clean and tempered to any degree desired. They are SILENT in operation, compact, good-looking.

Sturtevant Unit Heater-Ventilators provide the architect and engineer with an adaptable heating and ventilating system that will fit almost every building and almost every special requirement. No costly duct work is necessary. Why not get the facts? Our new Data Catalog contains much information of interest and value to you . . . we will be glad to send you a copy.

B. F. STURTEVANT COMPANY

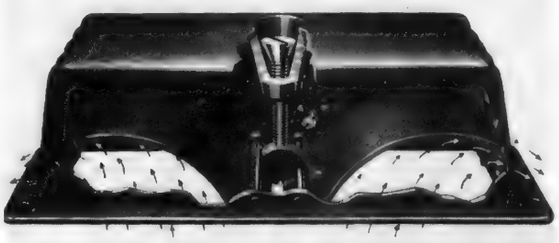
Plants and Offices at: Berkeley, Cal., Camden, N. J., Framingham, Mass., Galt, Ontario., Hyde Park, Mass., Sturtevant, Wis. *Canadian Representative:* Kipp Kelly, Ltd., Winnipeg, *also Branches in Principal Cities and Agents in Foreign Countries.*

40 pages of helpful data for the architect and engineer, including full information on Sturtevant Unit Heater-Ventilators, and showing typical installations. A copy will be sent for the asking.

Sturtevant

REG. U.S. PAT. OFF.

The Silent Unit Heater-Ventilator



(Patented)

ENFLO DIFFUSER

Permits Greater Velocity of Air without Drafts

For health and comfort, fresh air must be supplied without drafts to the occupants of the auditorium. The Enflo Diffuser accomplishes this by supplying air at a great velocity, parallel to the seats, thereby eliminating any draft at the feet.

The Enflo is made completely of quality cast iron, which will withstand unusual wear and abuse. The Enflo is so designed as to demand the minimum amount of labor to install it.

Write for Illustrated Catalog.

VENTILATING PRODUCTS CO.
2800 Cottage Grove Ave., Chicago, Ill.

H&V3-Gray

The TooPas Air Filter
cleans the air twice

BASED on the time tested principles of the Phoenix filter, the new TooPas insures high cleaning efficiency and the elimination of oil entrainment. Sectional construction fits any wall opening. *Send for the Bulletin.*

NATIONAL AIR FILTER COMPANY
5130 Ravenswood Ave., Chicago, Ill.

CENTRAL STATION STEAM CO.
2912 East Woodbridge St.
DETROIT, MICHIGAN

MANUFACTURERS OF

Cadillac Condensation Meters
Detroit Feed Water Meters

Packingless Expansion Joints and other special fittings for underground steam distribution mains.

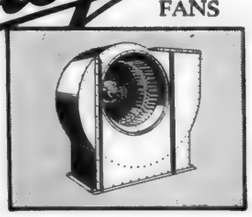
Frequently Bayley solves seemingly impossible problems in air engineering and equipment. Which is not to be considered remarkable, since this Company has been concerned with such problems for over 46 years . . . .

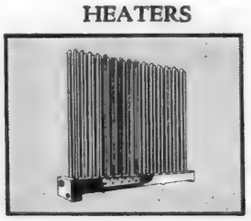
Is Your Bayley Library Complete? These valuable reference books will be mailed you on request:

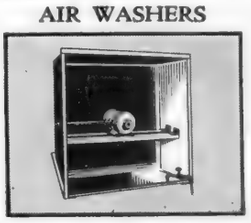
Catalog No. 26— Plexiform Fans
Catalog No. 30— Chinook Heaters
Catalog No. 25— Turbo Air Washers
Catalog No. 32— Aerovane Blowers
Catalog No. H1— Unit Heaters
Catalog No. R1— Induced Draft
Catalog No. B— Exhaust Fans
Catalog No. LD— Leather Dryers

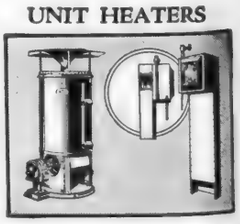
BAYLEY BLOWER COMPANY,
742 GREENBUSH ST., MILWAUKEE, WIS.
Representatives in Principal Cities

Bayley
Established 1883

FANS


HEATERS


AIR WASHERS


UNIT HEATERS


HEATING — VENTILATING — AIR CONDITIONING — PROCESS DRYING — MECHANICAL DRAFT — EXHAUST

WING FEATHERWEIGHT

Which Uses Less Heat?

Both buildings show 65° temperature at the working level—but the one with Wing Heaters uses less heat

HERE are sections of two buildings in both of which the thermometer registers 65° five feet from the floor—but look at the temperatures overhead! Obviously there is more heat being used (and paid for) in the building pictured on the left, heated by direct steam radiation.

This is what always happens when heated air is allowed to follow its natural course and rise to the roof. The overhead spaces have to be overheated in order to get the working level warm.

Wing Featherweight Unit Heaters work against this tendency of heated air to accumulate under the roof, as the low temperatures at high levels, in the building on the right, show.

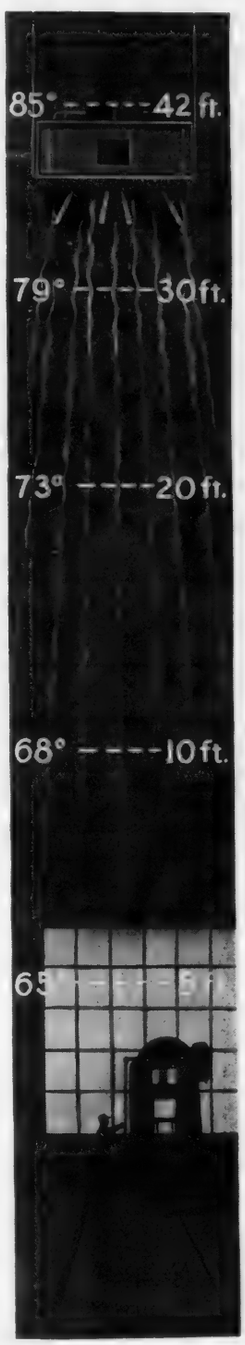
Wing Heaters are located overhead. They warm large volumes of air and deliver it to the working level by means of their powerful Scruplex Propeller Fans. All the air they heat *circulates*, so the heat you pay for warms the working levels before it has a chance to rise.

Wing heaters are as efficient at 40 feet above the floor level as they are at 15 feet. They are so light they can be suspended from any type of roof construction without reinforcement, and can be placed directly over the area to be heated so as to distribute heat in all directions. (This means fewer heaters.)

They are the most efficient unit heaters because they deliver heated air *vertically* downwards in large volumes and at sufficiently high velocities to permit its distribution over wide areas.

For full information about the Wing Heating System write for our new illustrated catalog.

Heat With Unit Heaters



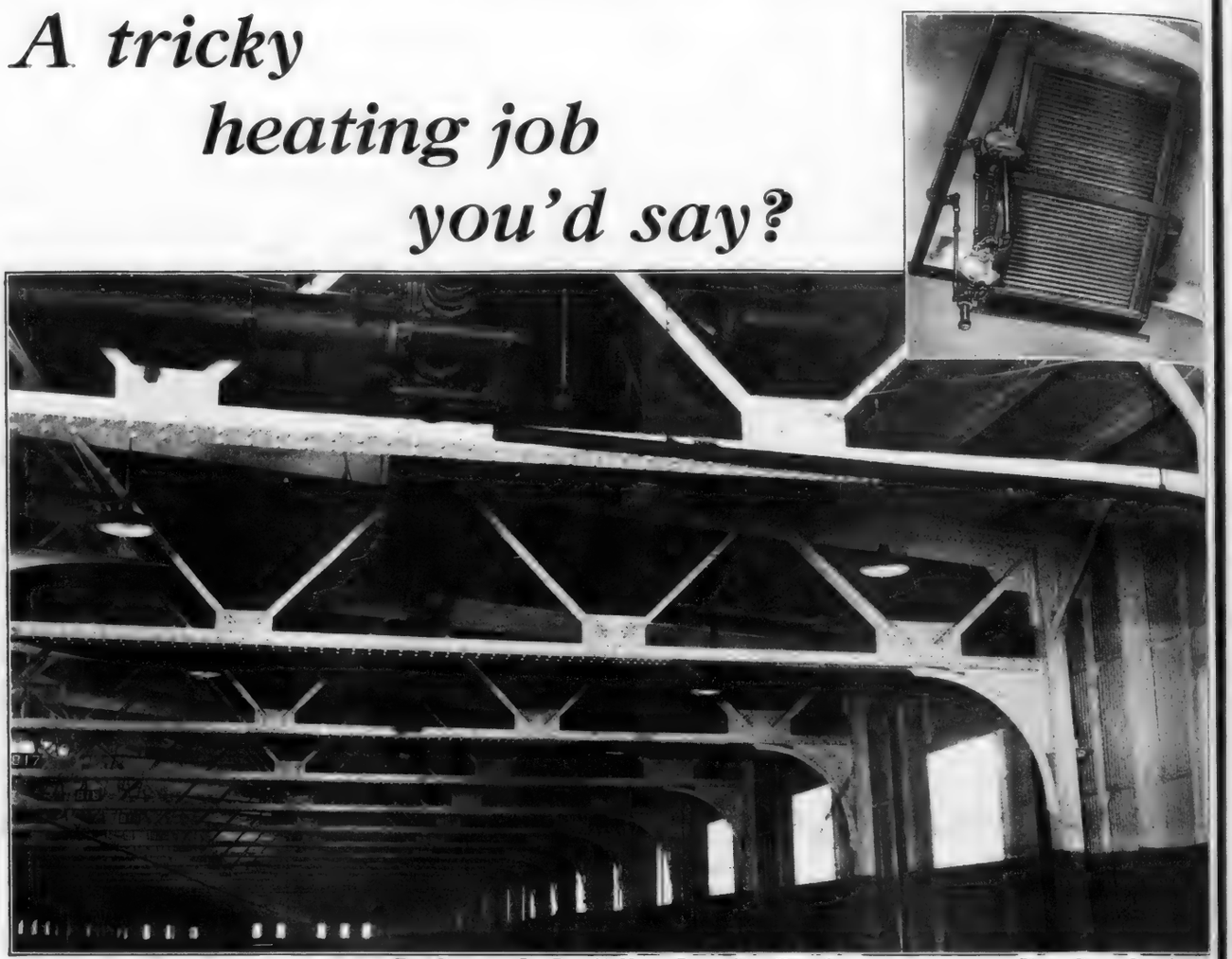
L. J. WING MFG. CO.

Dept. 5

158 West 14th St. New York, N. Y.

UNIT HEATERS

A tricky heating job you'd say?



ERIE RAILROAD CO., PIER 21, NORTH RIVER, NEW YORK CITY — Photos Brown Bros. for A.C.

Erie Railroad Co. Engineering Dept., Engineers — Henry R. Kent & Co., Heating Contractors — Buffalo Forge Co., Unit Heater

135,000 sq. ft. of Perishable Produce

on one undivided River Pier,—open doors at the street end, trucks whizzing in and out, blizzards howling up the open River! New York's mammoth daily fruit and vegetable supply to be protected,—quickly, uniformly, controllably, unfailingly! A tricky job, indeed,—for old-fashioned methods. But Unit Heaters with AEROFIN (The Standardized Light-Weight Fan System Heat-Surface which fathered the modern Unit Heater) did it as slick as a whistle,—because AEROFIN, as is, or as the heart of a Unit Heater, is light, compact, non-corrosive and in one of its three types* and 94 standardized *encased unit* sizes, instantly adaptable to any requirement.

***AEROFIN** (LOW PRESSURE), *Tube-Plate Construction, for pressures up to 50 lbs. gauge.*

***AEROFIN** (UNIVERSAL), *continuous seamless tubes, multiple-coil construction, for pressures from 2½ to 150 lbs. gauge.*

***AEROFIN** (HIGH PRESSURE), *continuous seamless tubes, for pressures from 25 to 350 lbs. gauge (Temp. 500° F.)*

All Units in standardized steel Casings, ready for Pipe and Duct connections.

Write for Bulletin V-59, gratis

Manufactured by

AEROFIN CORPORATION

850 Frelinghuysen Avenue, NEWARK, N. J.

39 Cortlandt Street, NEW YORK

Burnham Building, CHICAGO — **Land Title Building, PHILADELPHIA** — **United Artists Building, DETROIT** — **Oliver Building, PITTSBURGH** — **Paul Brown Building, ST. LOUIS**

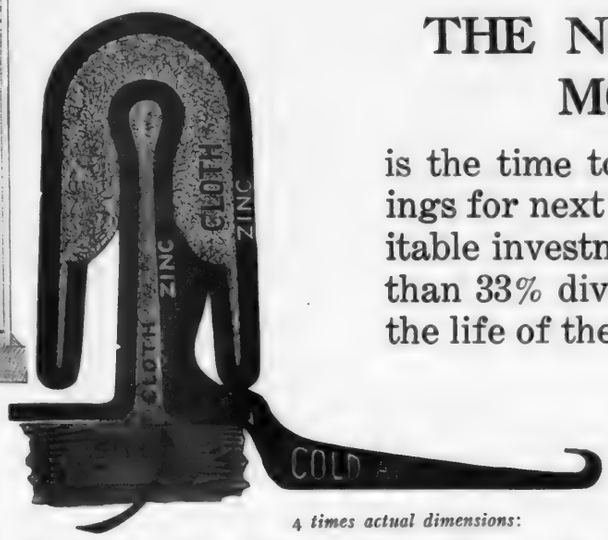
AEROFIN is sold only by Manufacturers of nationally advertised Fan Heating Apparatus

Finish the Job Right

Architects and Heating Engineers insulate ceilings, floors and walls with a wide variety of insulating methods and materials. Even the roof is considered of importance in keeping the heat from filtering out and the cold in.

The Job is never Completed

until Athey cloth or metal weatherstrips are protecting the windows from draft.



4 times actual dimensions:

This cloth insert makes a tight contact between metal and window frame.

THE NEXT FOUR MONTHS

is the time to draft-proof buildings for next winter. It is a profitable investment that pays more than 33% dividends annually for the life of the building.

Send for this New Athey Book

It contains valuable information for any building owner or manager, architect or engineer, desiring to save fuel, prevent drafts and increase comfort.

ATHEY WINDOW SHADES

are more than the most beautiful shade obtainable and long life is not the only economy. They eliminate the necessity of awnings and are better because they can instantly be adjusted to shade any part of the window, still allowing light to enter at the top. These attractive shades have proved, in hundreds of prominent buildings, their unusual durability and dust and dirt-repellent qualities, besides their freedom from annoying catches and springs.

Athey

CLOTH LINED METAL WEATHERSTRIPS and PERENNIAL WINDOW SHADES

ATHEY COMPANY

6057 West 65th St., CHICAGO

Representatives in all Principal Cities

IN CANADA:

Cresswell-McIntosh, Reg'd., Toronto & Montreal

Thirteen 18-inch Breezo-Fins heat this warehouse

"Heat With Unit Heaters"

Easily Installed

25% to 50% Saving over direct radiation

Save Floor Space

No Fire Hazard

Easily Operated

The 13 Buffalo "Breezo-Fin" Unit Heaters installed in this warehouse serve a double purpose. In cold weather they thoroughly heat the building, circulating the warm air throughout the rooms at a very small cost. Their heating efficiency is higher and far superior to that of direct radiation and the unit control gives a very flexible arrangement.

On hot summer days, the "Breezo" Fans on these units provide an excellent ventilating system.

If you are not fully acquainted with the advantage of these heaters, write for our catalog No. 467.

Other types for other buildings

Our new "Lowboy" and "Highboy" Unit Heaters are appropriate for any type of building as they can be installed vertically, horizontally or inverted and are suitable for floor or wall bracket mounting or for ceiling suspension.

Catalog No. 468 gives complete details and data on these units.

Buffalo Forge Company

480 Broadway, Buffalo, N. Y.

In Canada: Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

"Buffalo"

Heating and Ventilating Mechanical Draft Apparatus

Heated by YORK

THIS panel of famous concerns was taken from the York moving picture film, "Making B. T. U.'s Behave." These names are but a small part of the number there shown.

Every one of these concerns is a York customer. They have, practically without exception, their own engineering staffs, in addition to consulting council as needed.

These engineers, by approval of York Heat-Diffusing Units, have endorsed the efficient heating results obtainable by York, brought about by adherence to sound fundamental engineering principles. The Tenth Anniversary Model of York Units is proof positive of how sound York design and operation have been from the very start. The principles of operation are exactly the same as in the first York Model. The test of *time* has proven the soundness of York design. That is why, today, York Units are delivering more B. T. U.'s than any other Units; why York production leads the Industry; why York is able to show such an amazing list of customers.

Full information is always available through our many Branch Offices. Do not hesitate to write. *York Heating & Ventilating Corp'n, 1539 Sansom Street, Philadelphia.*

Super-fin Coils *Can't Leak*

The coils in York Units are York Super-Fin. Their design has revolutionized the manufacture of extended surface coils. They have no joints to leak—tubes are fused to the headers. U-bend construction eliminates expansion and contraction strains, and pitch of tubes provides natural drainage. Every coil tested to 1000 pounds hydrostatic pressure and guaranteed for 200 pounds working pressure. Super-Fin Coils are making an astonishing record in the field of blast radiation.

Details of U-Bend Tube Construction

YORK
HEAT-DIFFUSING
UNIT

"Heat with Unit Heaters"

YORK Heat-Diffusing Unit

YORK HEATING & VENTILATING CORP'N, PHILADELPHIA

Sources of Satisfaction

Improvements in automatic control, applied to the burner you sell, are just as great a source of customer satisfaction as a refinement in the burner itself developed by your own engineers in your own laboratory. Time-O-Stat knows that its success depends on producing automatic controls for you which will insure the satisfaction of your customers.

For these reasons Time-O-Stat promised the heating industries controls and control systems which should be second to none. Many refinements and improvements in Con-Tac-Tor and Time-O-Stat controls are already available. These are outlined in our new 1929 catalogs.

If you have received your copy, look it over carefully; if you haven't received one, send for it without delay, advising whether you are interested in Oil or Gas Controls, and complete information will be immediately forthcoming.

TIME-O-STAT CONTROLS COMPANY
ELKHART, INDIANA

Successor to

Absolute Con-Tac-Tor Corporation
Time-O-Stat Corporation
Cramblet Engineering Corporation
Leachwood Company

Manufacturers of AUTOMATIC CONTROLS *for*

Oil Burners - Gas Burners - Electric Refrigerators - Mechanical Stokers - Furnace Fans
Industrial Ovens - Ice Machines - Unit Heaters - Water Heaters - *Also* Sign Flashers
Mercury Switches - Electric Heaters - Corrugated Metal Bellows

Specialists in District Heating

Equipment for Underground Steam Lines

ADSCO RED DIAMOND BRAND WOOD CASING
has an efficiency of above 91%.

Yale and Towne Spend Money to Save Money

In selecting the casing to protect and insulate their underground steam lines, the Yale and Towne Company looked beyond the lure of low first cost and saw that ADSCO Red Diamond Brand Casing would be an investment in superior performance and long life.

ADSCO Casing has a proved efficiency of above 91%. It is built of kiln-dried, accurately machined wood staves. These staves are keystone in shape, interlocked by tongue and groove, and firmly held in position by heavy metal bands. This construction, together with the tubular shape of ADSCO Casing, enables it to withstand easily the crushing weight of the earth and the heaviest surface loads above.

With proper drainage ADSCO Casing will last for 25 years or longer as demonstrated by past performance. For complete information on its construction, sizes and advantages, send for ADSCO Bulletin No. 1101. Fill in and mail the coupon below today.

ADSCO Engineers Are At Your Service

The broad experience of ADSCO Engineers embraces every phase of pipe line construction from planning to installation. Feel free to call upon them for advice on any contemplated work. They will give you unstinted co-operation.

AMERICAN DISTRICT STEAM COMPANY

NORTH TONAWANDA, N.Y.

to be sure of getting

ADSCO

EXPANSION JOINTS

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"These Oil Burners paid for themselves"

Vick Chemical Company get "perfect satisfaction" with Johnson Automatic Oil Burning Equipment

A high standard of efficiency has been set at the Philadelphia plant of the Vick Chemical Company where exacting temperature control is essential in the manufacture of Vick's VapoRub. The superintendent of this factory writes:

"We have used the equipment for about two years with perfect satisfaction, during which time the saving in fuel and labor alone has been more than enough to pay for the two installations, aside from eliminating all dust, and also the storage space for coal."

A size and type for every purpose

In small homes, large buildings, factories and industrial plants Johnson Oil Burners have been enthusiastically endorsed. Each product is fully guaranteed—the result of more than 23 years in the exclusive manufacture of oil burning equipment.

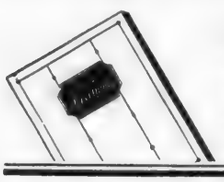
Opportunity for dealers

Some very valuable territory is open for dealers and distributors of the right calibre. Johnson dealers have the distinct advantage of selling a *complete* line of oil burning equipment made by *one* manufacturer. Complete sales promotion cooperation, merchandising and sales financing plans—all backed by a far reaching national advertising campaign.

JOHNSON OIL BURNERS

Listed as Standard by the Underwriters Laboratories
Member of Oil Heating Institute

S · T · JOHNSON CO.
940-50 ARLINGTON STREET / OAKLAND, CALIFORNIA



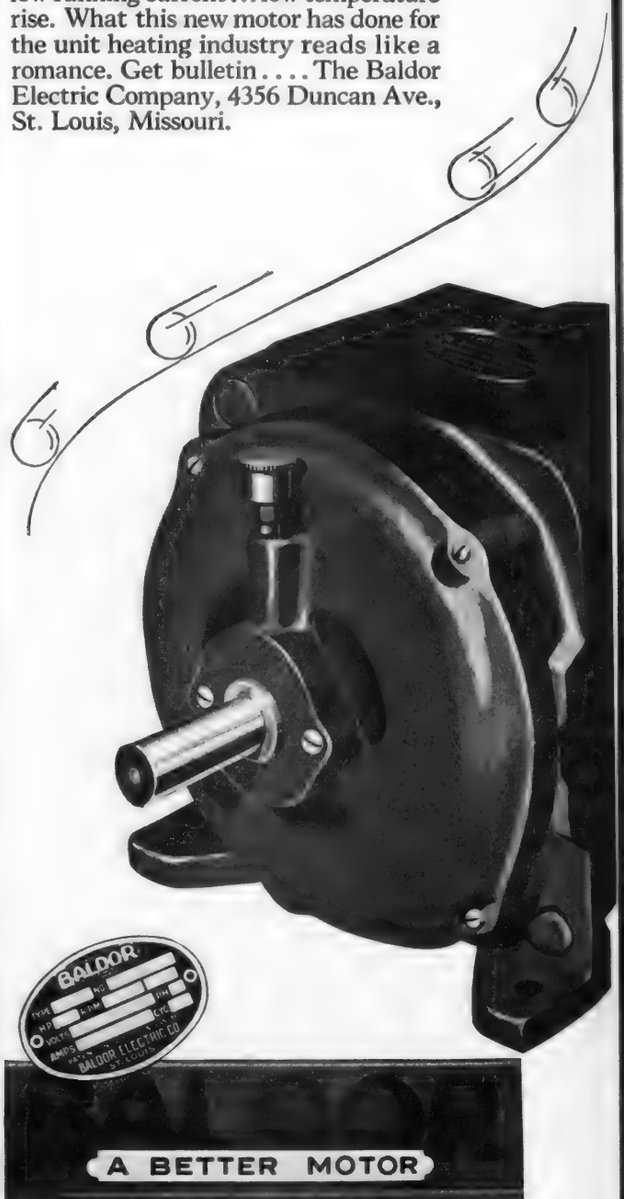
Send for this new book—IT'S FREE!

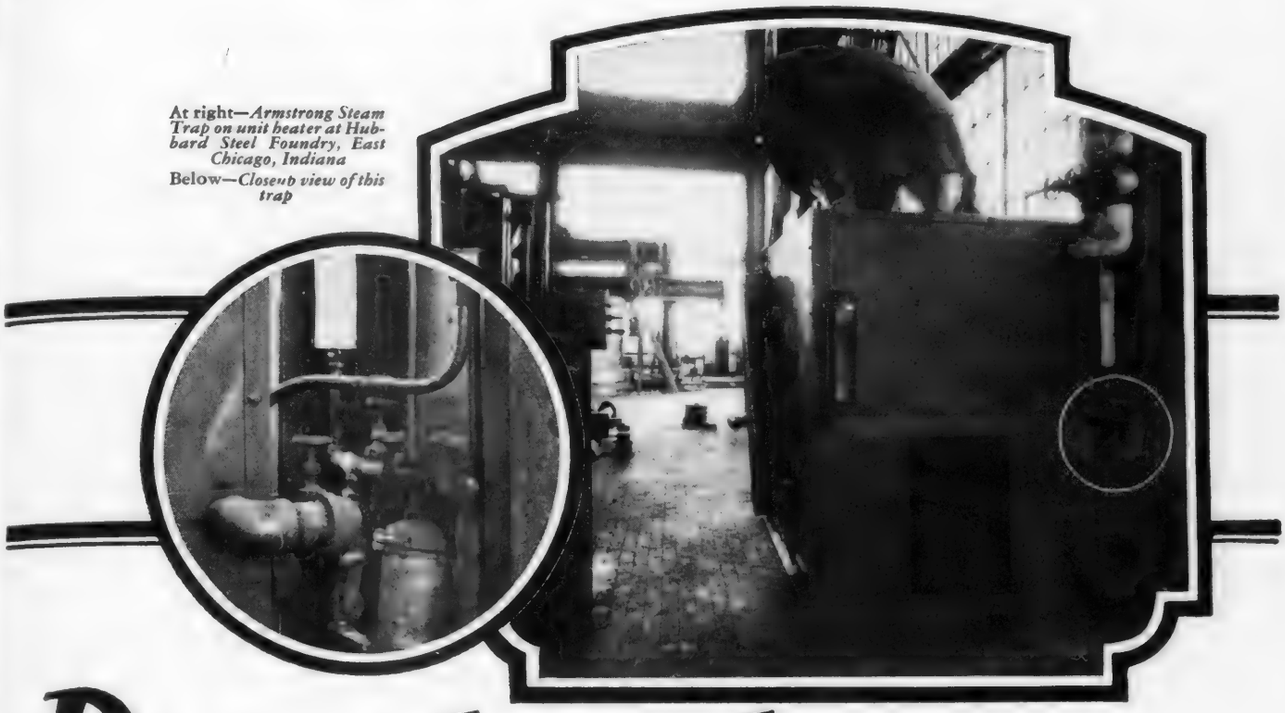
"Today's Opportunity," tells how you can build a profitable and substantial business. It shows why the Johnson Franchise offers greater dealer profits. Just write "Today's Opportunity," please—on your letterhead or business card and your copy will be sent without delay. Address Dept. 529A.

ARCHITECTS AND HEATING & VENTILATING ENGINEERS WERE RESPONSIBLE

In is an accepted fact that the new adjustable varying speed Baldor Motor has revolutionized unit heating. After the motor was announced, everyone appreciated its merit, but architects and heating & ventilating engineers were responsible for its universal acceptance.

A turn of the switch on the Baldor Controller Box regulates the Variable Speed Baldor Motor to 40%, 60%, 80% or maximum speed. Thus heat in buildings so equipped is more quickly and easily controlled than with any other equipment . . . no brushes . . . no centrifugal switch . . . ball bearings . . . quiet . . . compact . . . high efficiency . . . high power factor . . . low starting current . . . low running current . . . low temperature rise. What this new motor has done for the unit heating industry reads like a romance. Get bulletin . . . . The Baldor Electric Company, 4356 Duncan Ave., St. Louis, Missouri.





At right—*Armstrong Steam Trap on unit heater at Hubbard Steel Foundry, East Chicago, Indiana*
Below—*Closeup view of this trap*

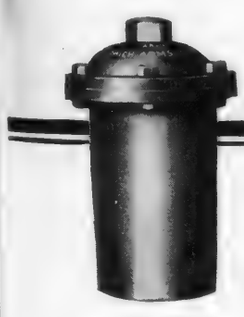
Don't handicap your unit heater

Operating a unit heater without draining off the condensate as fast as it forms is as wasteful as burning coal that's partly slate. The condensate does no heating itself and displaces that much live steam.

The modern way of removing condensate is by the use of Armstrong Traps, which also discharge entrained air and gases. They give uninterrupted, dependable service, irrespective of pressures and temperatures, and are light and compact enough to be supported by the pipes in which they are placed.

We'll gladly cooperate with engineers and architects in determining the proper kind of trap for any type of heating job, without obligation.

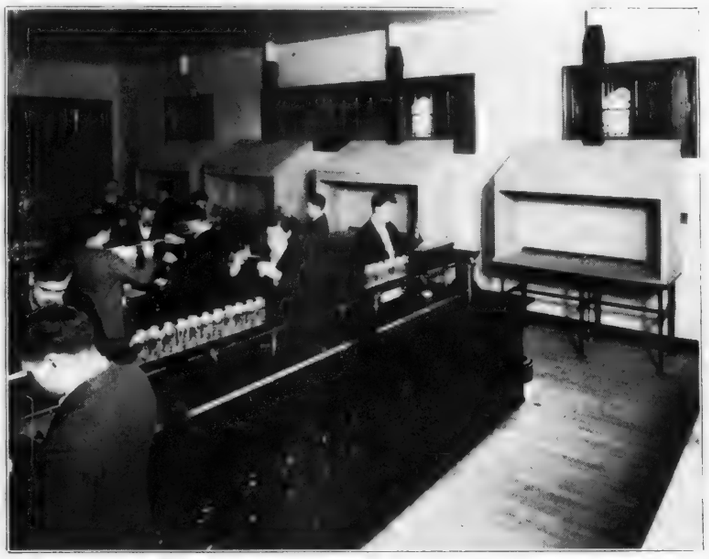
Note the small size and simplicity of the Armstrong Trap. No gauge glasses or air relief cocks are required. Crating for shipment is eliminated



ARMSTRONG
MACHINE WORKS
346 Maple Street, Three Rivers, Mich.
District Representatives in 40 Cities

ARMSTRONG TRADE MARK "INVERTED BUCKET" STEAM TRAP

Acid Fume Exhausting



Villa Nova College
Villa Nova, Pa.

General Chemical Laboratory
Mendel Hall

The four fume hoods in the picture above are handled by one Duriron No. 150-A Fan. Six Duriron fans handle all the corrosive conditions in this Villa Nova laboratory.

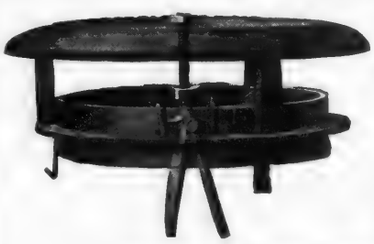
THE wide variety of corrosive fumes that must be exhausted from the chemical laboratory provides the "acid test" for any exhaust fan.

Here Duriron's universal resistance to virtually all fumes and gases enables these fans to operate efficiently and with a minimum of attention.

No coating or lining is required. Long life is assured. Higher speeds than possible with other resistant materials give correspondingly greater capacities.

The Duriron fan bulletin contains complete data and information, and should be in your files.

Duriron is produced only by
The DURIRON COMPANY
DAYTON·OHIO



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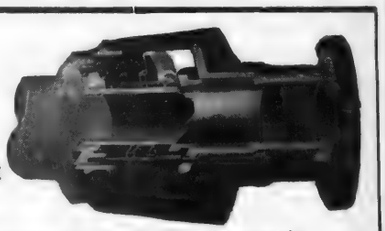
POSITIVE AIR CONTROL AT FLOOR LEVEL

ÆOLUS DICKINSON
3336-44 So. Artesian Ave. CHICAGO
(Some territory open for agents)

ROSS Crosshead-GUIDED Expansion Joint Excels in



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Over 60% of sales—Repeat Orders
Once Used—Always Demanded
Every Purchaser—A Customer

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New York, Chicago, Philadelphia, Boston, Cleveland, St. Louis, Detroit, Pittsburgh, Baltimore, San Francisco, Seattle, Denver, Salt Lake City, Omaha, Montreal, Toronto.

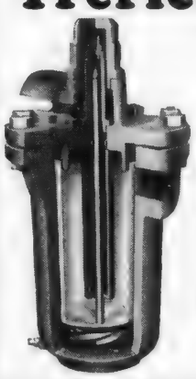
This Catalog

should be in the possession of every Heating and Ventilating Engineer. Mark the items below in which you are interested and you will receive a copy, with prices, and whatever you may need in the way of information on any Atlas product.

- ☐ Temperature Regulators
- ☐ Reducing Valves
- ☐ Damper Regulators
- ☐ Pump Governors
- ☐ Float Valves
- ☐ Swing Joint Fittings
- ☐ Bronze Unions
- ☐ Thermostats
- ☐ Balanced Valves

ATLAS VALVE COMPANY
REGULATING VALVES FOR EVERY SERVICE
281 South Street, Newark, N. J.

Trerice Steam Trap



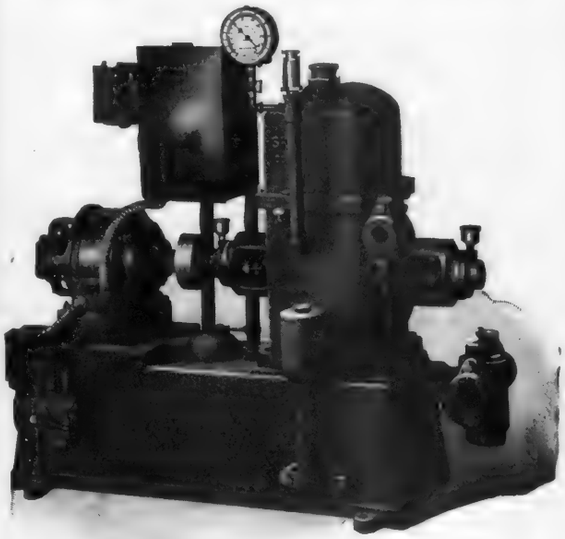
The trap that lasts longer because of the ROTATING VALVE

We will send prepaid to any reputable organization a TRERICE TRAP for 90-day *free test.*

Write for Particulars

H. O. TRERICE COMPANY
1338 West Lafayette Blvd.
Detroit, Michigan

SKIDMORE



Which Will You Have

high or low water line in the system when operating on float control?

The Skidmore pump on interceptor base is designed to give low water line operation without pitting.

The unit is self contained, ball bearing, and operated by one motor. It produces vacuum on the system even when operating on float control, a desirable feature.

The unit consists of two pumps in one housing on one shaft, an air pump and a centrifugal pump for boiler feed. Motor and pump are mounted directly on interceptor base. This construction means compactness in design and minimum floor space occupied.

The automatic starter together with vacuum regulator and float switch are mounted on this unit. All wiring is installed at the factory.

Bulletin No. 6 illustrating this unit is now available.

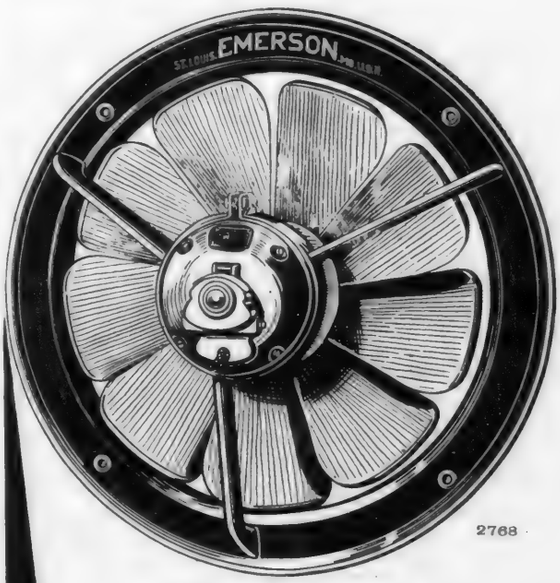
SKIDMORE CORPORATION

General Offices and Factory

1535 Dayton St. CHICAGO, U. S. A.

Representatives in principal cities

Canadian Representatives, Darling Bros., Limited
120 Prince Street, Montreal



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Sturdiness and dependability have been achieved in Emerson Exhaust Fans without excessive weight.

The entire supporting ring assembly, including motor support band, is of formed steel construction. Supporting arms are semi-tubular and welded to ring. This construction provides maximum strength with minimum weight, assures rigidity and prevents vibration.

Sizes 12 — 16 — 18 — 24 — 30 — 36 inches.

Automatic aluminum leaf shutters to fit all sizes.

Write for full information.

The Emerson Electric Mfg. Co.
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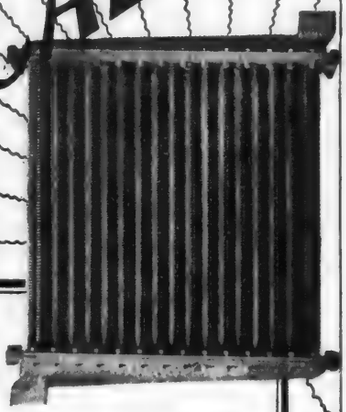
806 W. Washington Blvd., Chicago, Ill.
150 Church St., New York City

EMERSON EXHAUST FANS

***Made by the makers of* Emerson 1/30 to 2 H. P. Motors. A.C. and D.C.**

HELICALFIN



Extended Surface Radiation

Sturdy Non-Corrosive Highly Efficient Low Air Resistance Type

A seamless Copper Tube Heater of great efficiency for all forced air heating systems. Thousands of installations are giving unequalled service.

Helicalfin Tubes are equipped with flat copper radiating fins. There are no corrugations to catch the dirt. We supply a size of Helicalfin Tube for every type of heat transfer equipment.

We will be glad to send on request, specification engineering data without charge or obligation.

ROME-TURNEY RADIATOR CO.
ROME, N. Y.
Makers of Good Radiators Since 1905

CLEAN, EVEN HEAT
at a Saving of 15% to 50%!

"Its Superiority is Proven by the Character of its Users."

Install the

FIRE-KING
Automatic
COAL BURNER

By burning the cheaper grades of bituminous or lignite screenings, or buckwheat anthracite—and burning fewer tons with greater efficiency—the FIRE-KING cuts coal bills from 15% to 50%.

In addition the FIRE-KING eliminates smoke by burning all the volatile gases; automatically maintains any desired temperature or pressure; cuts labor costs; increases efficiency; increases boiler capacity; pays for itself quickly in fuel saved.

Hundreds in use in apartments, schools, hospitals, hotels, churches, office buildings, public buildings, greenhouses, laundries, clubs, factories, etc.

Let us give you complete information on this dependable, rugged stoker for boilers of 10 to 200 H.P. Write today for Bulletin "H".

FIRE-KING STOKER CO.
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SALES ENGINEERS—

The FIRE-KING franchise affords you a profit possibility seldom duplicated. It is selling fast! Distributors are building a sound, substantial business with this line. Some splendid territory still open — write today for full details of the FIRE-KING franchise.

THERMOSTATIC METAL

The most accurate, constant and durable of expansion units

FOR LOW AND HIGH TEMPERATURES

Our No. 1800 metal for temperatures up to 350° F.
Our No. 2800 metal for temperatures up to 1500° F.

Positive and Dependable Thermostatic Metals

W. M. CHACE VALVE COMPANY
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P-H-I-L-L-I-P-S

Self-Drilling Expansion Shells

Every shell makes its own hole. Used in ceilings, walls, floors and beams for fastening pipe hangers, etc., and for bolting timber and other equipment to concrete and stone. Internal U. S. Standard Threads for rods, bolts and screws.

Quickly installed by hand or with PHILLIPS SPRING HAMMER. No DRILLS required.

Write for full details

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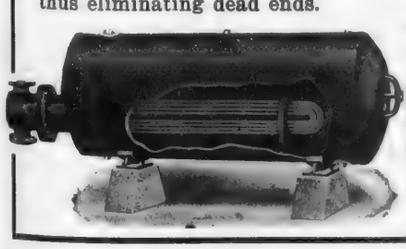
42 YEARS PERFORMANCE PROVES FITZGIBBONS STEEL BOILER ECONOMY

Fitzgibbons Boiler Company, Inc.
570 Seventh Avenue, N. Y. City
Representatives in principal cities.

Uniform Circulation—No Dead Ends

Heavy-gauge copper tubes are formed into U-bends to accommodate expansion and contraction, permitting each tube to expand and contract independently.

Tubes extend to opposite end of tank and are placed well to the bottom to increase efficiency of heater and cause uniform circulation throughout length of tank, thus eliminating dead ends.



Tanks and parts for all sizes carried in stock. Write us for further details.

O. E. FRANK HEATER & ENGINEERING CO., Inc.
Factory and Offices at Buffalo, N. Y.

A "REAL" UNIT HEATER TRAP

The No. 73 Sterlco TRADE MARK Unit Heater Trap

"Has All the Desirable Features"

Non air binding
No cooling leg required
Cannot freeze
Drains completely when cold
No supports required
Only one moving part

STERLING ENGINEERING CO.
1626 Holton Street
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Agencies located in principal cities

DE BOTHEZAT BIFURCATOR

The new ventilating device securing the perfect protection of the motor from:

dust, acid fumes, hot, smudgy, greasy air.

No extended shaft used nor bending of ducts necessary.

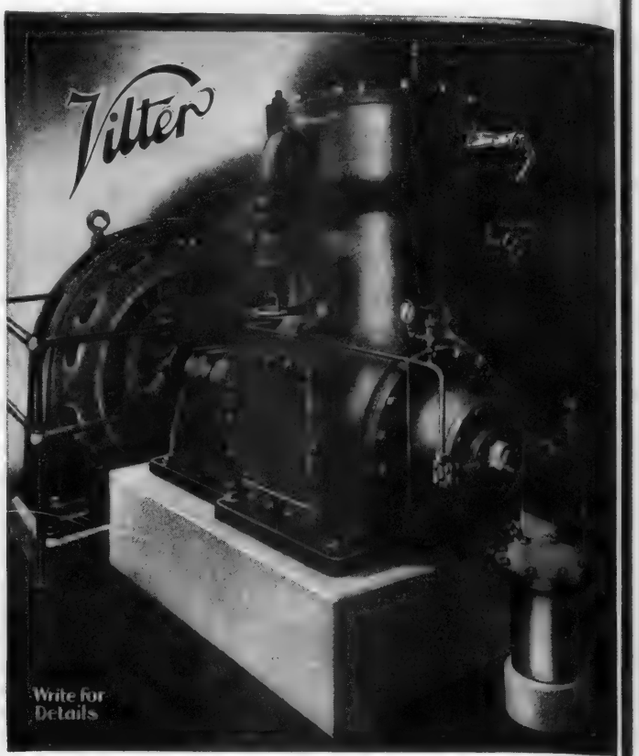
New De Bothezat Bifurcator

For special ventilating jobs where fumes of excessive temperature or corrosive character are to be removed. The bifurcator is a device that permits the use of a *straightway duct.* It eliminates right angle bends and long shaft connections, at the same time protecting and automatically cooling the motor. A *short shaft* connects the fan to the motor, which is located in a transverse opening through the duct. The fan chamber is *stream lined in* section, and the *bifurcated duct is not reduced in area at this point. Full details on request.*

Simple, Highly Efficient, Trouble Proof — Yet Inexpensive —

You cannot find a more compact and powerful device than the De Bothezat Bifurcator used in conjunction with the *De Bothezat Disc Pressure Fan,* well known for its *high efficiency, high static pressure* and *non-overloading power characteristics.*

DE BOTHEZAT IMPELLER CO., Inc.
1922 Park Avenue
New York, N. Y.



Pretty as a picture . . . EFFICIENT AS A ROBOT!

YOUR cooling and ventilating departments will be grateful for the cooperation this company offers. For no matter what problem confronts you, if it involves refrigeration in any phase, our engineers are ready to help you secure the right answer.

And . . . . . to Vilter the "right answer" means the 100% right result with low cost of installation, lower operating expense and lowest upkeep.

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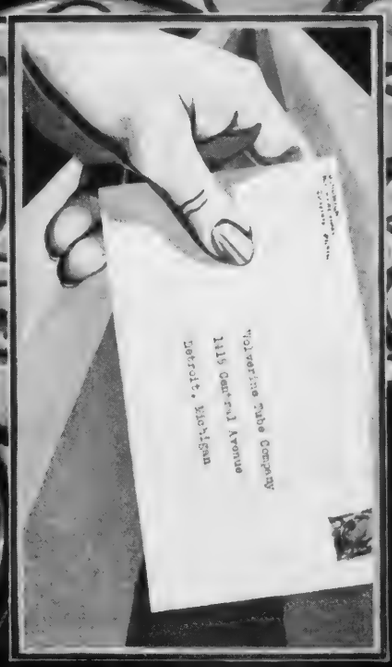
Vilter

The Vilter Manufacturing Co.
804 Clinton Street
Milwaukee, Wis.

For an authoritative solution of your refrigeration problems consult our Engineering Department.

41-29

SINCE 1867



Request Our Tubing Prices

Job after job quoted on by our Manufacturing Department against our customers' own shops, shows we save them money on seamless tubing parts. Big volume, better equipment, specialized men—are the reasons.

We Want to Quote Where Quality Counts

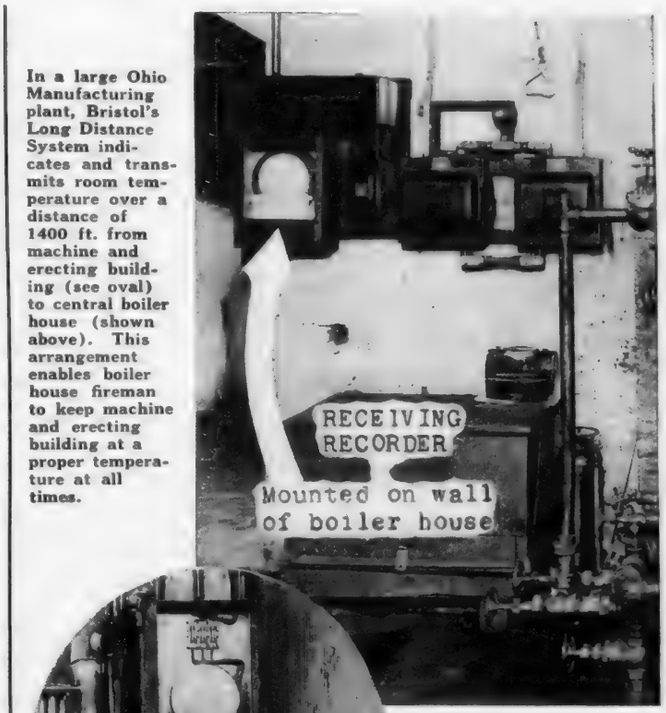
WOLVERINE TUBE CO.

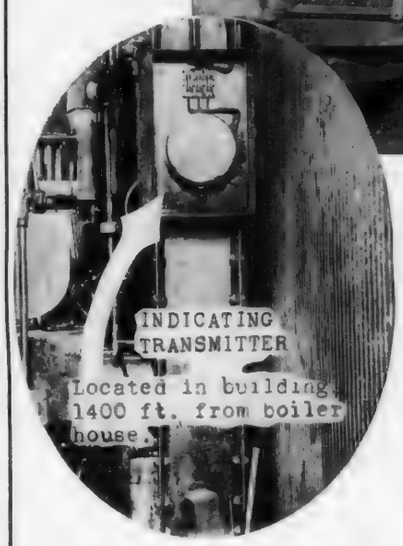
SEAMLESS COPPER BRASS & ALUMINUM

1415 Central Ave., Detroit, Michigan

Sales Offices: Cleveland; Chicago; Atlanta; Los Angeles; Denver; Dayton, Ohio; New York City; Dallas, Texas.

In a large Ohio Manufacturing plant, Bristol's Long Distance System indicates and transmits room temperature over a distance of 1400 ft. from machine and erecting building (see oval) to central boiler house (shown above). This arrangement enables boiler house fireman to keep machine and erecting building at a proper temperature at all times.





Remote Heat Control with BRISTOL'S

Long Distance Transmitting and Recording System

Operating to transmit records of temperature, pressure, liquid levels, motion, speed, etc., from distant locations to a centralized point of control is the unique service rendered by Bristol's Long Distance System. This system can be installed to operate with equal facility over a distance of a few hundred feet or even up to several miles.

Used extensively in central heating stations, and in connection with heating plants of large industrial concerns, this Bristol's Equipment provides a constant survey of temperatures in all parts of the plant or system. Such information, being usually transmitted and continuously recorded in the central boiler house, enables firemen to better control boiler operation, with a resultant saving of steam and economy of fuel consumption.

Detailed description of Long Distance Equipment is interestingly presented in Catalog No. 1900. Send for a copy. There's no obligation.

The Bristol Company

Waterbury, Connecticut

A copy of this catalog is reserved for you. It shows the latest Mercoid developments in oil burner control equipment. Write for it today.

ANOTHER OUTSTANDING MERCOID DEVELOPMENT

New Tipless Tube

Guarded Lead-in Wires

The latest and most improved design in mercury tube switches. The Tipless Tubes with guarded lead-in wires give added protection. These tubes are made with the utmost skill under scientific methods formulated in the Mercoid Laboratory. Submit your requirements.

THE MERCOID CORPORATION

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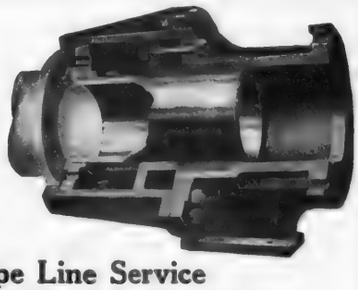
MERCOID CONTROLS

HOWARD
Guided
Expansion
Joint



For Pipe Line Service

Eliminates trouble from Expansion and Contraction, saves space, labor and repair bills; the construction is mechanically correct.

ALBERGER HEATER CO.
HOWARD IRON WORKS
285 Chicago St.
Buffalo, N. Y.

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ENGINEERS'
SPECIFICATION
INDEX

Frost Research Laboratory

A nationally recognized research service for the Heating and Ventilating Industry.

The Frost Research Laboratory, Inc.
1326 Markley St. **Norristown, Pa.**

VALVES
PIPE FITTINGS
FIRE HYDRANTS

KENNEDY

Kennedy All Bronze Standard Gate Valve designed for 125 pounds working steam pressure and built with both screwed and flanged ends. One of the many Kennedy types.

EVERY Kennedy Valve design, whether for high pressure steam service, low pressure condensing water service, fire protection service, or other pipe line control, is based on over 50 years of experience in meeting the constantly developing problems of valve requirements. In all that time, no Kennedy Valve type has ever had to be withdrawn because of faulty design—a striking proof of the uniform excellence of Kennedy products and your security in standardizing on them.

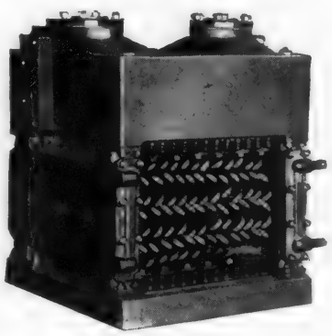
Send for the Kennedy Catalog

The Kennedy Valve Mfg. Co.
Elmira, New York

WAREHOUSES: New York, 128-132 White Street; Chicago, 1335-1337 S. Clinton Street; San Francisco, 448-450 Tenth Street.

SALES OFFICES: New York, Philadelphia, Cleveland, Chicago, Atlanta, Salt Lake City, El Paso, Los Angeles, San Francisco, Seattle.

BRYAN

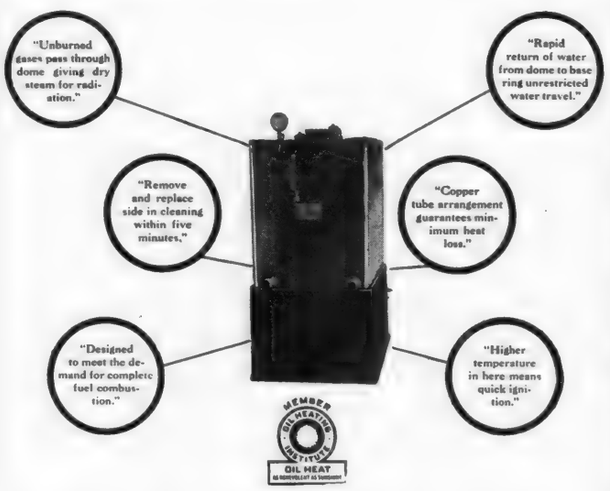


COPPER TUBE

BOILERS

The story of the success of Bryan Boilers is written in thousands of homes throughout the country. The Bryan solves the problem of economical oil consumption and offers the utmost in cleanliness, appearance, ease of operation, efficiency and honest-to-goodness heating power.

We urgently suggest that you investigate the sales possibilities of this modern household necessity.


"Unburned gases pass through dome giving dry steam for radiation."
"Rapid return of water from dome to base ring unrestricted water travel."
"Remove and replace side in cleaning within five minutes."
"Copper tube arrangement guarantees minimum heat loss."
"Designed to meet the demand for complete fuel combustion."
"Higher temperature in here means quick ignition."
MEMBER OIL-HEATING INSTITUTE
OIL HEAT

BRYAN STEAM CORP.

BOILER DIVISION

506 BRYAN BLDG.

BRYAN

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PRICED RIGHT

A dollar's worth for every dollar you spend. That's what you get in Swartwout Steam Products. Ask for complete catalog.

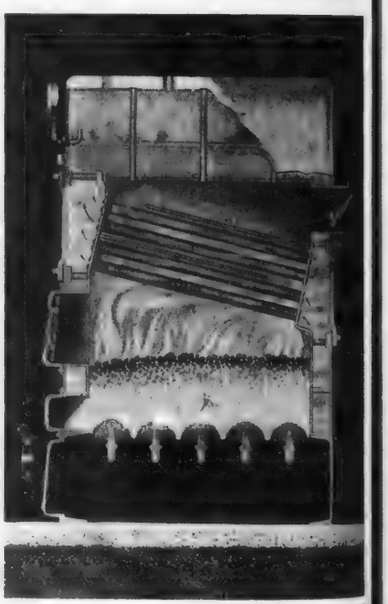
THE SWARTWOUT COMPANY
18511 Euclid Avenue
Cleveland, Ohio

Swartwout Steam Products

COAL
OIL
GAS
BOILERS

ESTABLISHED
1885

Good Boilers Ever Since



Coal—Oil—Gas Boilers

Now built in larger sizes, including Oil and Gas Boilers up to 8400 feet of steam radiation, and Coal Boilers, both Direct Draft and Smokeless, up to 6000 feet of steam radiation.

Write for Catalogue which tells the complete Knowlton story.

ORR & SEMBOWER, Inc., READING PA.

Chicago, Illinois
208 N. Clinton St.

New York City
50 Church St.

Nugent Crank Case Fuel Oil Filter

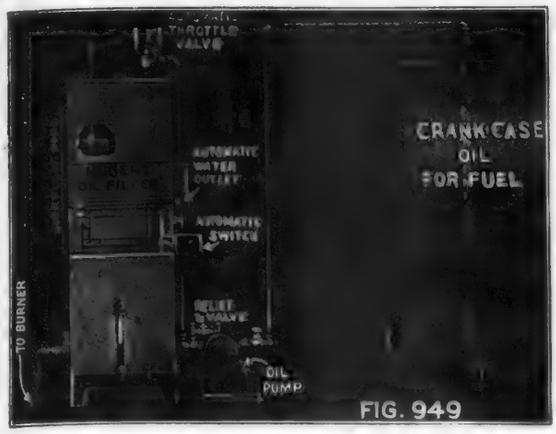


FIG. 949

HEAT YOUR BUILDING WITHOUT COST
BY BURNING DISCARDED CRANK CASE OIL
NO MORE BURNER TROUBLE

Write for catalog

WM. W. NUGENT & COMPANY
409 N. Hermitage Ave., Chicago, U. S. A.

Builders since 1897 of
Oiling Systems — Oiling Devices
Oil Filters — Oil Pumps

Easy to install.

Just break the Oil Burner Suction Pipe and set it in.

They are shipped all assembled ready for use.

Only two connections to make.

Read this Letter

MONARCH GARAGE
1122-1130 HOLLYWOOD AVENUE AT THE L
CHICAGO, ILL.

Wm. W. Nugent & Co. December 19,1927.
Chicago,Ill.

Gentlemen:-

About a year and a half ago we purchased from you a Nugent Oil Filter and motor driven oil pump to filter automobile crank case oil for our oil burner.

This purchase has been one of the best investments we ever made, because the apparatus paid for itself in less than three months. We operate our burner on the filtered crank case oil entirely, consequently we have no fuel bills.

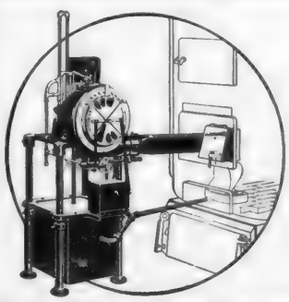
The filter removes the water, dirt, grit, and carbon from the oil so efficiently that the fine mesh strainer at the burner never has to be cleaned, and the burner operates perfectly.

Cleaning the filter requires only ten minutes twice a week and there is no other upkeep to the filter, as the filtering elements will last for years without renewing.

We are very pleased with the filter and pump as well as the service you have given us. We highly recommend your apparatus to anyone.

Very truly yours,

MONARCH GARAGE
By E. L. Fell



Continuous Flame Dependable Heat

No Gas Pilot · · No Electric Ignition
Graduated Automatic Control
Mechanical Draft

McILVAINE OIL BURNER
Listed by Underwriters

Distributors—Write for the McIlvaine Sales Plan
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Specify RADIAFIN TUBES

for Air-Heating and Air-Cooling Units

½" to 6". Lengths up to 15 ft.
Send for our Data Sheet

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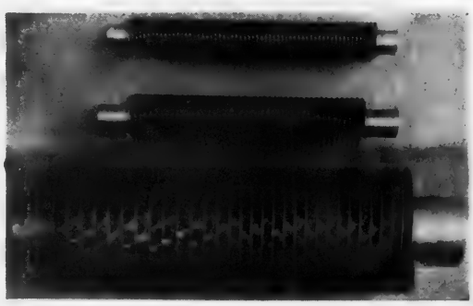
1153 THOMPSON ST.
PHILADELPHIA, PA.



"Comfort costs less with a *Newport!* Our heating man knew"

THIS diagram shows the unique magazine-feed principle of the Newport Boiler. You fill the magazine never more than once a day . . . usually two or three times a week, as the weather requires. As the fuel burns away at the bottom gravity feeds more coal from above. An even fire-bed is maintained.

Successful heating for 15 years. Thousands of satisfactory installations have proven the soundness of Newport-magazine feed-heating.

"WHEN we began to build our home," said the vivacious young matron, "Fred thought he could do without expert advice. But now he swears by our Heating Contractor because he put in our Newport Boiler. It keeps the house cozy all winter without much care and Fred delights in telling our neighbors that he pays $6.00 less per ton for the fuel we use."

Architects, veteran Heating contractors, and thousands of home-owners recommend the Newport, the residence heater which in the past 15 years has become the accepted standard for modern, easy and cheap heating.

The Newport gives better-than-ordinary service because of its better-than-ordinary design. Its magazine feed ensures healthful, even heating with negligible boiler attendance. In average winter weather the magazine needs filling but two or three times a week. (See diagram at left.)

Even more vital to the family man with many financial obligations is Newport *economy*. Utilizing No. 1 Buckwheat and adaptable to several other cheap fuels, a Newport will positively reduce the annual fuel bill 30 to 50%.

Newport's missionary work with home-owners and builders is drawing inquiries from hundreds of interested prospects. Some of these are in your territory. Send the coupon for an outline of our 1929 sales plan and see how Newport helps you to get a lot of profitable business.

NEWPORT BOILER COMPANY
Division, Hart-Parr Company
529 S. Franklin St., Chicago

A size for every need, Bungalows, Homes, Apartments and other buildings. Steam, Vapor or Hot Water systems.

Fill in your name and address and return this coupon

NEWPORT BOILER CO., 529 S. Franklin St., Chicago.

I'm interested in your 1929 selling plan.

.....

.....

.....

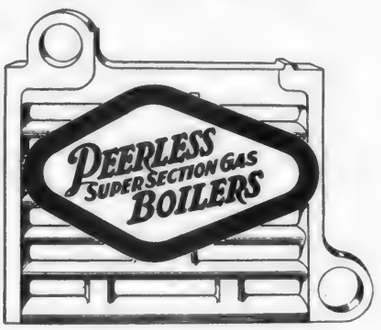
NEWPORT MAGAZINE FEED BOILERS

Distributors in all Principal Cities U.S. and Canada

Not only for heating —FOR INDUSTRIAL USES, TOO

PEERLESS OFFERS

more value per dollar; more capacity per sq. ft. of floor space



For the generation of steam, for all processes up to 15 lbs. pressure, these Super Section Boilers meet all industrial requirements efficiently.

In such work they provide:

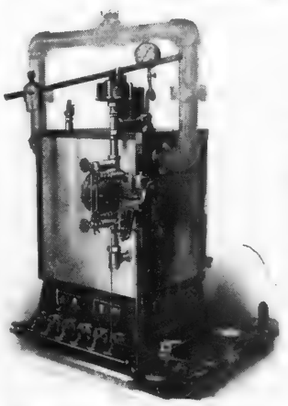
- Very dry steam.
- Freedom from priming and lifting.
- Fire surfaces easily accessible for cleaning.
- Exceptionally long life.
- Reliable water feeds and low water safety cut-offs.
- Simple and sensitive steam pressure control.
- Accurate and guaranteed H.P. ratings.

Boilers can be furnished with or without jackets.

Peerless prices are reasonable and our policy protects, encourages and helps our dealers in their selling. Get away to a good start in gas boilers by handling the modern SUPER SECTION.

THE PEERLESS HEATER CO.

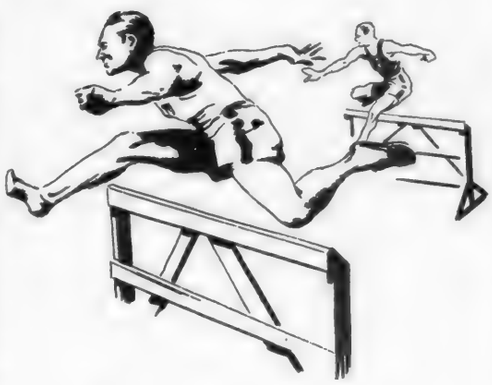
Boyertown, Pennsylvania



Peerless SUPER SECTION Gas Boilers are widely used for hot water, steam and vapor systems. Their ratings are guaranteed. A Duco-finished, splendidly insulated, Super Sectioned model of advanced efficiency, of any size to properly heat your customer's home can be delivered quickly. They are easily installed. Write for full information and price list.

Round
Sectional

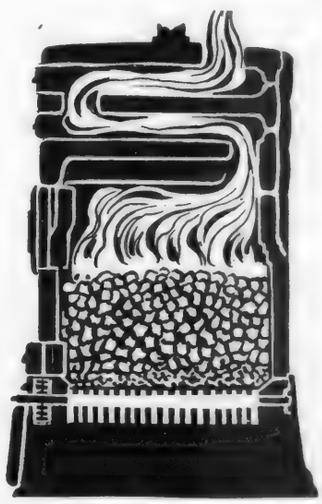
Burnham Boilers



Put The Fuel Over The Hurdles

Whether it's wood, coal, gas or oil, Burnhams make the hurdles in faster time on less fuel.

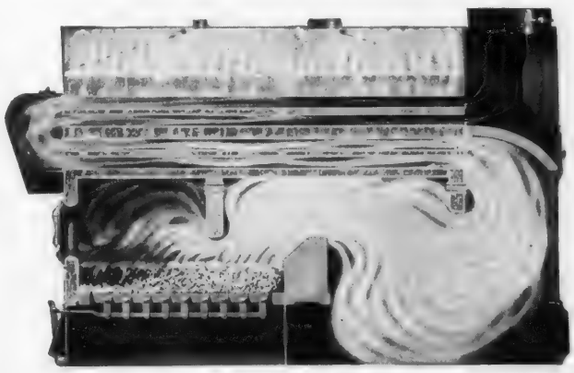
Do or don't you believe it? Thousands more believed it last year, and are believing it more than ever this.



Burnham Boiler Corporation

Irvington, New York

Representatives in all principal cities of the United States and Canada.



EXPERIENCE

Way back twenty years ago Johnston Brothers installed welding equipment. They were pioneers in the use of autogenous welding in boiler construction. In the progress from iron to steel, from hand built to machine built, from unit building to mass production, they were among the leaders. Back of Johnston Steel Heating Boilers is sixty-five years of boiler making experience plus a tremendous amount of modern research and experimentation.

JOHNSTON STEEL HEATING BOILERS

Here are the outstanding points about Johnston Boilers:

1. **Substantial construction**
2. **Efficient operation**
3. **Built to A.S.M.E. standards**
4. **Simplicity of design**
5. **65 years' boiler building experience**
6. **Fully guaranteed**

JOHNSTON BROTHERS, Inc.
FERRYSBURG, MICHIGAN

JOHNSTON BROTHERS, INC.
Ferrysburg, Michigan

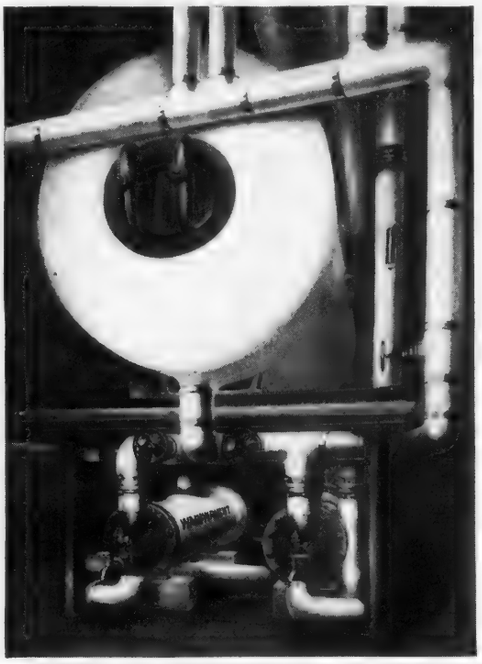
Gentlemen:

Send me a copy of your Bulletin illustrating and describing completely your Steel Heating Boilers.

Name .....

Address .....

City .....State.....



Wainwright hot water heaters may be used with or without storage tanks. The heaters are built in vertical or horizontal types and installed as space conditions permit.

A Reliable Hot Water Supply

Two Wainwright heaters, with storage tank above, as shown in the accompanying photograph, are used to supply hot water in a large institution. This service includes supplying with hot water, the kitchens, laundry, showers and a swimming pool.

The Wainwright heaters are of the floating head, instantaneous type. Either live or exhaust steam may be used for heating the water.

FOSTER WHEELER CORPORATION
165 Broadway, New York, N. Y.

Branches in Principal Cities

Foreign Associates:—
Foster Wheeler Limited; London, England.
Foster Wheeler Limited; Toronto-Montreal-Vancouver, Canada.

AERO UNIT COAL PULVERIZERS
AIR HEATERS CENTRIFUGAL PUMPS
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FRACTIONATING TOWERS HEAT EXCHANGERS
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CRANE CAST STEEL MATERIALS CONTROL HIGHEST PRESSURES AND TEMPERATURES

CRANE

CRANE VALVES AND FITTINGS KEEP PACE WITH ADVANCING INDUSTRIAL NEEDS

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152, 154, 156, 158
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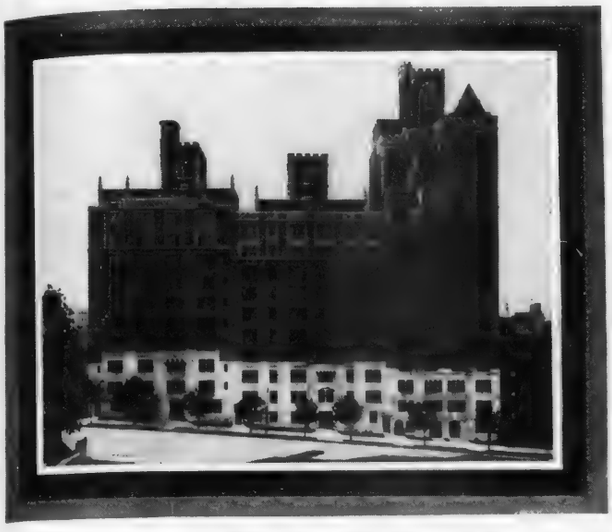
Save Money!

You Can Do It With Gorton Vapor Heating

There is a sure way for you to save money for your customer and for yourself. The GORTON Single Pipe Vapor System is the way to do it. Follow the lead of hundreds of others and let us give you this information. *Write today!*

GORTON HEATING CORPORATION
Manufacturers—Established 1887 96 Liberty Street, New York City



8th Unit, Tudor City, designed, financed and constructed by the Fred F. French Companies.

Tudor City's 8th Unit— *Paracoil Equipped*

Hot water for domestic use in this unit of Tudor City, is furnished by four Paracoil Storage Water Heaters.

In an enterprise as large as Tudor City, the skill and experience of only the best type of engineers and architects would necessarily be sought.

That these men, from their knowledge of Paracoil Water Heating equipment, felt safe in selecting it for Tudor City, is a matter of no small satisfaction on the part of the Davis Engineering Corporation.

If you personally are not familiar with the enviable record of dependable performance of Paracoil Equipment, we would be pleased to send bulletins, performance data and list of prominent installations. May we send them to you?

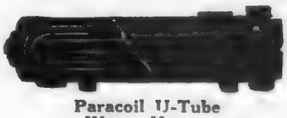
Paracoil Storage Water Heater (Vertical Type)

DAVIS ENGINEERING CORP.

90 West St., New York

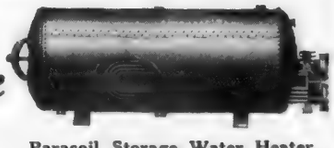
Factory: Elizabeth, N. J.

Paracoil
Water Heaters



Paracoil U-Tube Water Heater

—dependable performance



Paracoil Storage Water Heater (Horizontal Type)

Hot Water Goes Up, Up, Up, to the 48th Story

In this building three Patterson Hot Water Heaters supply the hot water for domestic service. Three Patterson Preheaters extract considerable of the heat from the condensate from the heating system and impart it to the domestic service water, thus also cooling the condensate before it is discharged into the sewer.

10 E. 40th St., New York, Ludlow & Peabody, Architects, Victor J. Cucci, Consulting Engineer, Baker, Smith & Co., Heating Contractors, James McCullagh, Inc., Plumbing Contractors.

Patterson
Hot Water Heaters and Preheaters

are sold with a definite, binding guarantee to furnish all the hot water required, as hot as required and as quickly as required—regardless of the requirements of building. And there is a 48-year old concern back of that guarantee ready to make good if the heaters do not live up to their promise.

On large important buildings, where you cannot afford to take a chance, specify the "Patterson." Send for our catalog.

The Patterson-Kelley Co.

107 East 40th Street **New York, N. Y.**

Raymond Duo-Stat

for steam
for hot water

The only satisfactory control for fully automatic operation of oil burners in apartment buildings, stores and offices. This remarkable heat balancer will solve your control problems. Write for our bulletin No. 2 and list of users.

F. I. Raymond Company
228 North LaSalle Street
Chicago, Ill.

OIL or STEAM SEPARATOR

Oil, Moisture or Slugs of Water *Cannot Pass*

FARNSWORTH CO.
Conshohocken, Penna.

CONTROL THE SPEED
OF YOUR VENTILATING EQUIPMENT!
REGULATE WARM AND COLD AIR VOLUME
WITH THE TIME TESTED
HORTON
VARIABLE SPEED
PULLEY

HORTON MANUFACTURING COMPANY
3008-3016 University Avenue S.E. Minneapolis, Minn.
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Manufacturers and Engineers
ESTABLISHED 1910

USOZONE

"United States Ventilating Ozonizers"

USOZONE

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Factory and Sales Office, SCOTTDALE, PENNA.

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Carrier
AIR CONDITIONING
DRYING
REFRIGERATION

makes
"Every day a *good* day"
Air Conditioning

Humidification, Dehumidification
Centrifugal Refrigeration
Cooling of Public and Industrial Buildings
Temperature and Humidity Control
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Carrier Engineering Corporation
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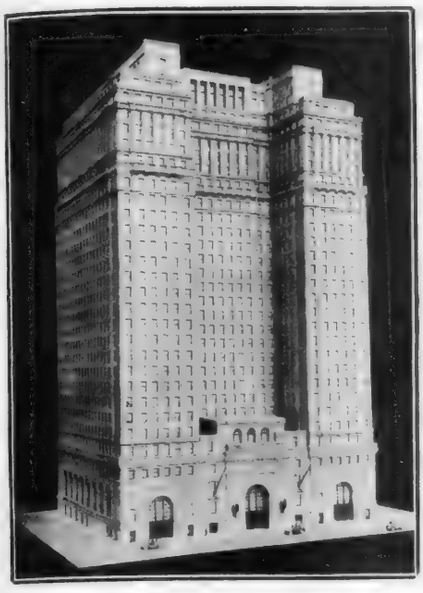
SALES OFFICES
New York Philadelphia
Boston Chicago
Cleveland
Los Angeles
Kansas City
Washington

See our detailed data in A. S. H. & V. E. Guide.

Literature on request. Write concerning your specific problem.

HOT WATER



One of Philadelphia's newest outstanding office buildings—the Fidelity — Philadelphia Trust—uses Whitlock Type K Heaters.

Modern development makes steadily increasing demands on all mechanical equipment.

The fact that

WHITLOCK SERVICE WATER HEATERS

are used in an increasing proportion of large modern buildings—speaks for itself.

A phone call will bring one of our district engineers or representatives.

The Whitlock Coil Pipe Company

40 South Street :: Hartford, Conn.

New York Philadelphia Baltimore Los Angeles
Boston Chicago Detroit San Francisco
and other principal cities. Consult telephone book.

In a Leading University of the South

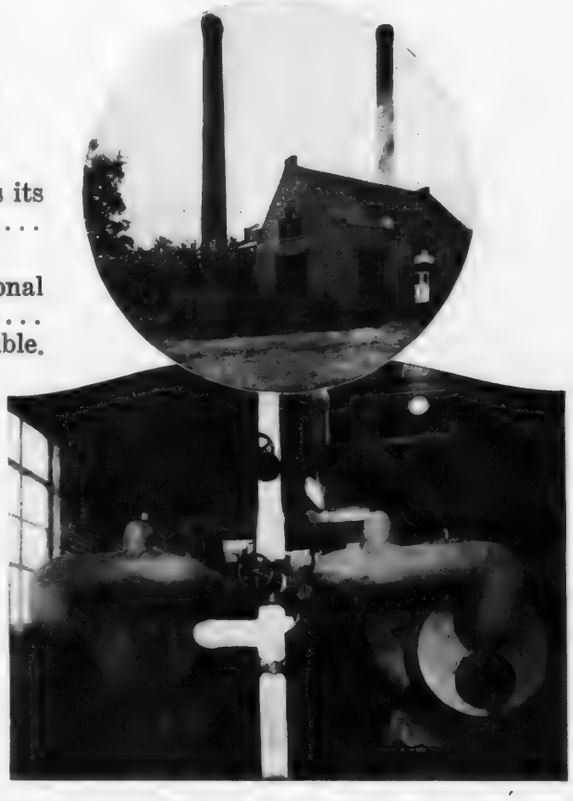
NATIONAL

Feed Water and Storage Heaters receive no classroom cuts

Each year brings its crop of verdant freshmen and speeds its seniors ... a carefree lot, from entrance to graduation ... spending precious cuts allowed, and others risked ...

But there's nothing except a steady grind for the National Heaters ... earning a degree for never missing an hour ... that know not how to riot, and never give the slightest trouble.

Here at Chapel in the University of North Carolina, the power plant was recently remodeled. New National equipment was added to old, increasing the capacity for service hot water, and handling the feed water for the boilers efficiently. Atwood and Nash, Architects and Engineers, and I. W. Summerlin, M.E., planned and supervised.



The University Power House and National Heaters are illustrated at the right.

You are trouble-free when you use National Heaters

Write for our quotations and descriptive bulletins.

THE NATIONAL PIPE BENDING CO.

Est. 1883

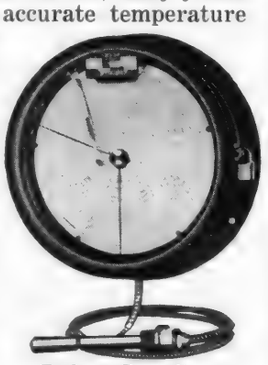
120 River Street, New Haven, Conn.

BOSTON NEW YORK PHILADELPHIA

Catch those dollar bills

If every dollar's worth of waste heat were dollar bills flying out of the top of your chimney, you'd soon have a man up there catching them and returning them to the bank. Install a Foxboro Flue Gas Thermometer with the "hot spot bulb." It will help to reduce materially the winged dollars of waste heat before they ever reach the stack.

Flue gas temperatures that rise above normal warn you that the boiler tubes are dirty or scaly or there are broken baffles, or poor draft regulation. If the flue gas temperatures drop, you know there must be holes in the fire, leaky joints or open fire doors. The accurate temperature record of a Foxboro Flue Gas Thermometer shows up these signs of waste instantly.



Foxboro Recording Thermometer

All Foxboro Instruments are guaranteed. This guarantee is sealed to each Instrument and is your tangible assurance that the Instrument will do the job for which it is designed. Write us now and we will place our years of experience at your disposal.

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Detroit Cleveland Tulsa Rochester, N. Y. Atlanta
San Francisco Dallas Los Angeles Portland, Ore.
Salt Lake City

AUSTRALIA—Alfred Snashall, Ltd., Sydney and Melbourne

FOXBORO

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THE COMPASS OF INDUSTRY

Instruments for Controlling, Recording and Indicating Temperature, Flow, Humidity and Pressure

THE KAINER PRESSURE GOVERNOR
The KAINER PRESSURE GOVERNOR
For Hot Water Heating Systems
Reduces the cost of a hot water layout.
Eliminates expansion tank and fittings (with its danger of freezing and overflowing).
Simplifies installation—makes a better job.
Saves your time and your customers' money.
Increases your profits and builds good will.
Write us for full information
KAINER & COMPANY CHICAGO
761-771 MATHER STREET
Manufacturers

"Sheer Comfort" Automatic Electric Heat Control

Consumer's Price **$38.00** Installed

Write for Prices

H. M. SHEER COMPANY

QUINCY Department HV **ILLINOIS**

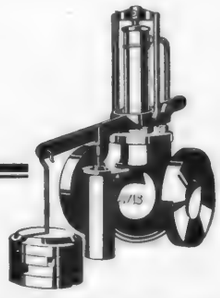
SAVE MONEY

The Geneseo State Normal School in New York State, are using a Rochester Circulator. They are saving over one thousand dollars per year on coal alone. This saving is proportional from bungalows to mansions, schools, churches, and other buildings.

Write to us for our latest catalog.

The Rochester Circulator Co.

Rochester, New York



PERFECTION IS NO TRIFLE—

But the careful consideration given to trifles with simplification of things mechanical tends towards perfection. Possibly this is the reason for the many years of popularity enjoyed by the Davis Pressure Regulator among men who seek satisfaction. First in America — first in the minds of discriminating users.

G. M. DAVIS REGULATOR CO.
436 Milwaukee Avenue, Chicago, Illinois

DAVIS AUTOMATIC VALVE SPECIALTIES

H & V5-Gray

Vapor Heating

assurance doubly sure when tied to the boiler with a

Wiley Safety Vent Vapor Regulator

Write for your copy of booklet describing the Wiley line of vapor heating specialties.

peerless quality product manufactured and sold exclusively by

The Simplex Heating Specialty Co.
(INC.)
Lynchburg, - Va.

Two New Bulletins

Two new bulletins describing Metaphram Damper Regulators have been prepared for distribution to the trade.

Bulletin LP-100 describes Metaphram Damper Regulators for low pressure boilers—steam, vapor or vacuum.

Bulletin F-100 describes the Type "F" Metaphram Damper Regulator for hot water boilers and domestic water heaters.

Heating contractors desirous of furnishing the most sensitive damper control it is possible to secure on boilers of their installation will be interested in the information contained in these bulletins.

New features of construction are shown that increase sensitivity; reduce friction and eliminate binding in the lever movement, permitting a freer transmission of power developed by the Metaphram units to operation of draft and check dampers.

Copies of either or both of these bulletins will be mailed on request. Just check and sign the coupon.

NATIONAL REGULATOR CO.
2309 Knox Avenue Chicago, Ill.

NATIONAL

National Systems of Heat Regulation and Humidity Control, Metaphram Dampers, Metaphram Motors, Industrial Thermostatic Devices, A-Jacks Steam Damper Regulator for high pressure boilers, Metaphram Damper Regulators for domestic steam, vapor, vacuum and hot water heating boilers, Metaphram Furnace Regulators.

METAPHRAM

NATIONAL REGULATOR CO., 2309 Knox Ave., Chicago
Send us ☐ Bulletin LP-100; ☐ Bulletin F-100.

Name.....

Address.....

Town.....State.....

W. J. Gilmore Building, Pittsburgh

Steam Consumption

	ESTIMATED	ACTUAL
October, 1927	556,000	215,000
November.....	1,205,000	1,035,000
December.....	1,668,000	1,204,000
January, 1928.....	1,853,000	1,496,000
February.....	1,462,000	1,141,000
March.....	1,297,000	1,104,000
	8,041,000	6,195,000

SAVING—1,846,000

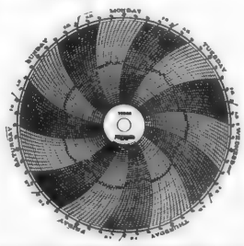
With Hornung Master Control Valve

Could you properly heat a building like this with steam shut off two-thirds of the time?

That's what Hornung Master Control Valves made possible in the heating of the W. J. Gilmore Drug Company Building, Pittsburgh. *Note carefully chart and table below.*

If no customer can use more steam than is really needed, you will save in the boiler room in mild weather, and in cold weather will have enough steam to serve more customers than you can now take on. And complaints from your customers about big bills will stop.

Temperature Chart No. 79903 covers Master Control performance for week ending February 8, 1928. It was taken from Hornung 8" Master Control Valve, controlling both pressures and temperatures in one valve. Clock type thermostat used.



Some of the largest plants in the country are stopping heat waste with Hornung Master Control Valves. Ask us for more particulars.

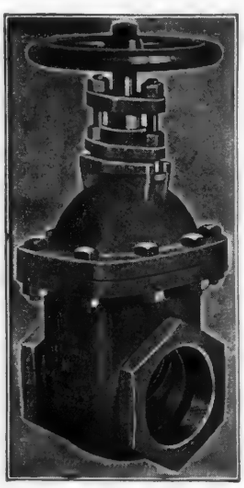
CENTRAL HEAT APPLIANCES

J. C. Hornung, *Engineer*

343 S. DEARBORN ST., CHICAGO

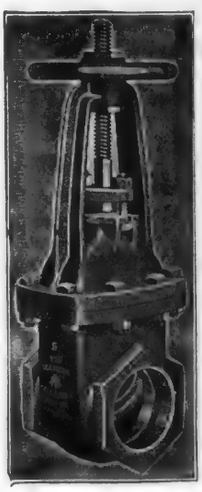
(4124)

IRON BODY GATE VALVES



SCREWED, FLANGED AND HUB END STYLES

NON-RISING STEM AND O. S. and Y. PATTERNS



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Cast and Malleable Iron Fittings
Brass Valves and Fittings

Illinois Malleable Iron Company

1801 Diversey Parkway :-: :-: Chicago, Ill.

Accurate Regulation

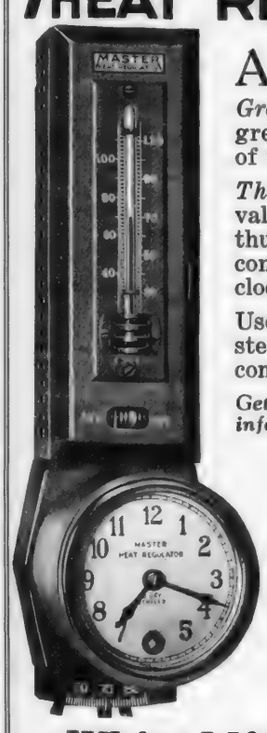
Assured with Kieley & Mueller Regulating Valves

For a period of 50 years Kieley Pressure Regulating Valves have maintained a prominent place in the Power Plant and Heating Field. Their remarkable simplicity of design and rugged construction have helped to maintain this predominance.

KIELEY & MUELLER, Inc.

34 West 13th Street NEW YORK CITY

MASTER HEAT REGULATOR



A PRECISION instrument with new, better features. *Gradual operation* giving the greatest possible uniformity of temperature.

Thermostat shows position of valves or dampers at all times, thus indicating to the user the condition of the fire. Plain or clock models.

Used with coal, gas or oil in steam, hot water, warm air or combination plants.

Get all the facts. Write for full information.

W-M-C Water Thermostats

For hot water heating systems—accurate, dependable, inexpensive. Installed without draining boiler or stopping fire.

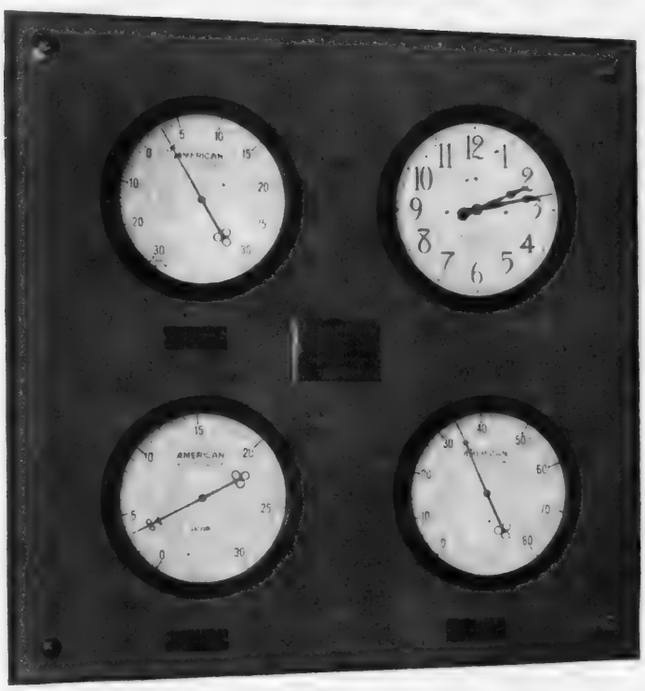
Write For Details Today!

Full Electric Motor

White Mfg. Co.

2362 University Ave., St. Paul, Minn.

GAUGE BOARDS



American Gauge Board in Chicago Motor Club, Chicago. Holabird & Root, Architects.

E. J. Claffey Company, Heating Contractors.

American Quality Gauges in 10' Flush Mounted Cases make ideal gauge board installations. You can be justly proud of an American Quality job.

Write for the following Catalogs:

Gauge Catalog A-14,
Recording Gauge Catalog E-14,
Gauge Tester Catalog D-14,
Relief and Pop Valve Catalog V-14,
Thermometer Catalog F-14,
Dial Thermometer Catalog G-14,
Recording Thermometer Catalog H-14,
Temperature Controller Catalog R-14.

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SINCE 1851

CONSOLIDATED ASHCROFT HANCOCK CO. INC.

Subsidiary of Manning, Maxwell and Moore Inc.

100 East 42nd Street, New York City

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Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
New York Blower Co., Chicago, Ill.

BELTING
Alexander Bros., Inc., Philadelphia, Pa.

BLOWERS
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Ilg Electric Ventilating Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
St. Louis, Blow Pipe & Heater Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

BOILERS, COPPER
Badger & Sons Co., E. B., Boston, Mass.

BLOWERS, FAN
(See Fans, Supply & Exhaust).

BOILERS, HEATING, CAST-IRON, COAL BURNING
American Radiator Co., New York.
Burnham Boiler Corp., Irvington, N. Y.
Combination Boiler Co., Benton Harbor, Mich.
Illinois Malleable Iron Co., Chicago, Ill.
International Boiler Works, East Stroudsburg, Pa.
National Radiator Corp., Johnstown, Pa.
Newport Boiler Co., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Pierce, Butler & Pierce Mfg. Corp., New York.
Spencer Heater Corp., Williamsport, Pa.
Weil-McLain Co., Chicago, Ill.

BOILERS, HEATING, DOWN-DRAFT, COAL BURNING
American Radiator Co., Buffalo, N. Y.
Brownell Co., The, Dayton, Ohio.
International Boiler Works, East Stroudsburg, Pa.
Kewanee Boiler Corp., Kewanee, Ill.
National Radiator Corp., Johnstown, Pa.
Orr & Sembower Co., Reading, Pa.
Pacific Steel Boilers Corp., Waukegan, Ill.
Page Boiler Co., Wm. H., New York.
Stanwood Corporation, Cincinnati, O.
Titusville Iron Wks. Co., Galesburg, Ill.

BOILERS, HEATING, GAS-FIRED
American Gas Products Corp., New York
American Radiator Co., Buffalo, N. Y.
Frost Mfg. Co., Galesburg, Ill.
International Boiler Works, East Stroudsburg, Pa.
National Radiator Corp., Johnstown, Pa.
Orr & Sembower Co., Reading, Pa.
Stanwood Corporation, Cincinnati, O.

BOILERS, HEATING, MAGAZINE FEED
Gorton Heating Corporation, New York.
Newport Boiler Co., Chicago, Ill.
Orr & Sembower Co., Reading, Pa.
Spencer Heater Co., Williamsport, Pa.

BOILERS, HEATING, OIL-FIRED
Bryan Steam Corp., Peru, Ind.
Combination Boiler Co., Benton Harbor, Mich.
International Boiler Works, East Stroudsburg, Pa.
Johnston Bros., Inc., Ferrysburg, Mich.
Titusville Iron Wks. Co., Galesburg, Ill.

BOILERS, HEATING, STEEL, COAL-FIRED
Brownell Co., The, Dayton, Ohio.
Coatesville Boiler Works, Coatesville, Pa.
Combination Boiler Co., Benton Harbor, Mich.
Fitzgibbons Boiler Co., Inc., New York.
Frost Mfg. Co., Galesburg, Ill.
Gorton Heating Corp., New York.
International Boiler Works, East Stroudsburg, Pa.
Heggie-Simplex Boiler Co., Joliet, Ill.
Johnston Bros., Inc., Ferrysburg, Mich.
Kewanee Boiler Corp., Kewanee, Ill.
Monitor Boiler Co., Philadelphia, Pa.
Pacific Steel Boilers Corp., Waukegan, Ill.
Stanwood Corporation, Cincinnati, O.
Titusville Iron Works Co., Galesburg, Ill.

BOILERS, POWER
Eclipse Fuel Engineering Co., Rockford, Ill.
Fitzgibbons Boiler Co., Inc., New York.
Frost Mfg. Co., Galesburg, Ill.
Pierce, Butler & Pierce Mfg. Corp., New York.
Stanwood Corporation, Cincinnati, O.
Titusville Iron Works Co., Galesburg, Ill.

CALORIMETERS
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.

CIRCULATORS, WATER
Janette Mfg. Co., Chicago, Ill.
Rochester Circulator Mfg. Co., Rochester, N. Y.

COILS, PIPE
Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Clow Co., Jas. B., Chicago, Ill.
Crane Co., Chicago, Ill.
Foster Wheeler Corp., New York.
National Pipe Bending Co., New Haven, Conn.
Walworth Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

CONDENSERS
Davis Engineering Corp., New York.
Foster Wheeler Corp., New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

CONDUITS, UNDERGROUND PIPE
American District Steam Co., North Tonawanda, N. Y.
Ric-wiL Co., The, Cleveland, Ohio.

CONVERTERS, HOT WATER
Davis Engineering Corp., New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.

COOLERS, AIR
Alberger Heater Co., Buffalo, N. Y.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.

COOLERS, OIL
Davis Engineering Corp., New York.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Spray Engineering Co., Boston, Mass.
Whitlock Coil Pipe Co., Hartford, Conn.

COOLING TOWERS & PONDS
Badger & Sons Co., E. B., Boston, Mass.
Buffalo Forge Co., Buffalo, N. Y.
Connor Co., Inc., The W. B., New York.
Foster Wheeler Corp., New York.
General Air Filters Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.

COVERING, BOILER, PIPE, ETC.
American District Steam Co., North Tonawanda, N. Y.
Crane Co., Chicago, Ill.
Ric-wiL Co., The, Cleveland, Ohio.

DAMPER REGULATORS
(See Regulators, Damper).

DAMPERS, DUCT
Buckeye Blower Co., The, Columbus, O.
Clarage Fan Co., Kalamazoo, Mich.

DEHUMIDIFYING APPARATUS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Johnson Service Co., Milwaukee, Wis.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.
York Heating & Ventilating Corp., Philadelphia, Pa.

DISTILLERS (WATER)
Badger & Sons Co., E. B., Boston, Mass.
Davis Engineering Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.

DRAFT APPLIANCES, MECHANICAL
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
DeBothezat Impeller Co., Inc., New York.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

DRYING SYSTEMS
(See Air Cooling & Drying Systems).

DUST COLLECTING SYSTEMS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Reed Air Filter Co., Inc., Louisville, Ky.
Skinner Bros. Mfg. Co., St. Louis, Mo.
St. Louis Blow Pipe & Heater Co., Inc., St. Louis, Mo.

DUST COLLECTORS
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Skinner Bros. Mfg. Co., St. Louis, Mo.
St. Louis Blow Pipe & Heater Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
York Heating & Ventilating Corp., Philadelphia, Pa.

ENGINES, STEAM
American Blower Co., Detroit, Mich.
Brownell Co., The, Dayton, Ohio.
Clarage Fan Co., Kalamazoo, Mich.
Frost Mfg. Co., Galesburg, Ill.
Pierce, Butler & Pierce Mfg. Corp., New York.
Stanwood Corp., Cincinnati, O.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

EQUALIZING LOOPS
Hoffman Specialty Co., New York.
Sarco Co., Inc., New York.

EVAPORATORS, BOILER FEED MAKE-UP
Buffalo Forge Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
Foster Wheeler Corp., New York.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.

EXHAUST HEADS
Aeolus Dickinson, Chicago, Ill.
Crane Co., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Swartwout Co., Cleveland, Ohio.

EXHAUST SYSTEMS
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Ilg Electric Ventilating Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
St. Louis Blow Pipe & Heater Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

EXHAUST SYSTEMS, ACID
Duriron Co., Inc., The, Dayton, O.

EXPANSION JOINTS
Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., North Tonawanda, N. Y.
Badger & Sons Co., E. B., Boston, Mass.
Central Station Steam Co., Detroit, Mich.
Crane Co., Chicago, Ill.
Foster Wheeler Corp., New York.
Fulton Sylphon Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Walworth Co., New York.
Webster & Co., Warren, Camden, N. J.

EXPANSION SHELLS
Phillips Drill Co., Chicago, Ill.

FANS, ACID RESISTING
Duriron Company, Inc., The, Dayton, O.

FANS, CENTRIFUGAL
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Ilg Electric Ventilating Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
St. Louis Blow Pipe & Heater Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

FANS, DISC
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
DeBothezat Impeller Co., Inc., New York
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

FANS, PROPELLER
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
DeBothezat Impeller Co., Inc., New York
Emerson Electric Mfg. Co., St. Louis, Mo.
Hartzell Propeller Co., Piqua, Ohio.
Ilg Electric Ventilating Co., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

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Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Ilg Electric Ventilating Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
St. Louis Blow Pipe & Heater Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

FANS, STEEL PLATE
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

FEEDERS, BOILER
Cashin Co., W. D., Boston, Mass.
Cissell Mfg. Co., W. M., Louisville, Ky.
Crane Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.
Walworth Co., New York.

FILTERS, (AERATING)
Davis Engineering Corp., New York.

FILTERS, CRANK CASE OIL
Nugent & Co., Inc., Wm, W., Chicago, Ill.

FILTERS, FEED-WATER
Davis Engineering Corp., New York.

FITTINGS, ACID RESISTING
Crane Co., Chicago, Ill.
Duriron Co., Inc., The, Dayton, O.

FITTINGS, PIPE, COMPRESSION
Nugent & Co., Inc., Wm., W., Chicago, Ill.

FITTINGS, PIPE, FLANGED
Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Walworth Co., New York.

FITTINGS, PIPE, SCREWED
Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Walworth Co., New York.

FLANGES
Crane Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Walworth Co., New York.

GAS BURNERS
Cleveland Gas Burner & Appliance Co., Cleveland, Ohio.
General Gas Light Co., Kalamazoo, Mich.

GASKETS, ASBESTOS
Crane Co., Chicago, Ill.
Jenkins Bros., New York.

GASKETS, METALLIC
Crane Co., Chicago, Ill.
Jenkins Bros., New York.

GASKETS, RUBBER
Crane Co., Chicago, Ill.
Jenkins Bros., New York.

GAUGE BOARDS
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Clow Co., Jas. B., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

GAUGE GLASSES
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Crane Co., Chicago, Ill.
Jenkins Bros., New York.

GAUGES, ALTITUDE
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Mercoid Corporation, Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Pierce, Butler & Pierce Mfg. Corp., New York.

GAUGES, DRAFT
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro, Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

GAUGES, HYDRAULIC
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.

GAUGES, OUNCE GRADUATED
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol, Co., The, Waterbury, Conn.
Dunham Co., C. A., Chicago, Ill.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

GAUGES, PRESSURE
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Cook Electric Co., Chicago, Ill.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Pierce, Butler & Pierce Mfg. Corp., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

GAUGES, TANK
Cook Electric Co., Chicago, Ill.
King-Seeley Corp., Ann Arbor, Mich.

GAUGES, VACUUM
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

GAUGES, VACUUM (COMPOUND)
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Pierce, Butler & Pierce Mfg. Corp., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

GAUGES, WATER
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Cook Electric Co., Chicago, Ill.
Crane Co., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York.

GENERATOR COOLING SYSTEMS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Reed Air Filter Co., Inc., Louisville, Ky.
Schutte & Koerting Co., Philadelphia, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

GOVERNORS (PUMP)
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Webster & Co., Warren, Camden, N. J.

GRATES, DUMPING
Fitzgibbons Boiler Co., Inc., New York.
Kewanee Boiler Corp., Kewanee, Ill.
Stanwood Corp., Cincinnati, Ohio.

GRATES, ROCKING
Kewanee Boiler Corp., Kewanee, Ill.
Page Boiler Co., Wm. H., New York.
Stanwood Corp., Cincinnati, Ohio.

GRATES, SHAKING
Fitzgibbons Boiler Co., Inc., New York.
Kewanee Boiler Corp., Kewanee, Ill.
Page Boiler Co., Wm. H., New York.
Stanwood Corp., Cincinnati, Ohio.

GRATES, SHAKING AND DUMPING
Frost Mfg. Co., Galesburg, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Stanwood Corp., Cincinnati, Ohio.

GRATES, SHAKING, CIRCULAR
Fitzgibbons Boiler Co., Inc., New York.

GRATES, STATIONARY
Fitzgibbons Boiler Co., Inc., New York.
Frost Mfg. Co., Galesburg, Ill.
Stanwood Corp., Cincinnati, Ohio.

HEAT CABINETS
(See Radiators, Cabinet and Concealed)

HEATERS, AIR, FAN SYSTEM
Aerofin Corp., Newark, N. J.
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Dwyer Equipment Co., Chicago, Ill.
Ilg Electric Ventilating Co., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
National Air Filter Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Rome-Turney Radiator Co., Rome, N. Y.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Thermal Units Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
Wing Mfg. Co., L. J., New York.

HEATERS, DOMESTIC WATER
Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Crane Co., Chicago, Ill.
Davis Engineering Corp., New York.
Excelso Products Corp., Buffalo, N. Y.
Foster Wheeler Corp., New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Illinois Malleable Iron Co., Chicago, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Modine Mfg. Co., Racine, Wis.
Monitor Boiler Co., Philadelphia, Pa.
National Pipe Bending Co., New Haven, Conn.
Page Boiler Co., Wm. H., New York.
Patterson-Kelley Co., New York.
Pierce, Butler & Pierce Mfg. Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sims Co., The, Erie, Pa.
Weil-McLain Co., Chicago, Ill.
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, ELECTRICAL UNIT
American Blower Co., Detroit, Mich.
Ilg Electric Ventilating Co., Chicago, Ill.

HEATERS, FEED WATER, (CLOSED)
Alberger Heater Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
Foster Wheeler Corp., New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Frost Mfg. Co., Galesburg, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Sims Co., The, Erie, Pa.
Stanwood Corp., Cincinnati, Ohio.
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, FEED WATER (OPEN)
Frost Mfg. Co., Galesburg, Ill.
National Pipe Bending Co., New Haven, Conn.
Sims Co., The, Erie, Pa.
Stanwood Corp., Cincinnati, Ohio.
Webster & Co., Warren, Camden, N. J.

HEATERS, FUEL-OIL
Alberger Heater Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Davis Engineering Corp., New York.
Electrol, Inc., St. Louis, Mo.
Excelso Products Corp., Buffalo, N. Y.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
National Air Filter Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, UNIT
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Dwyer Equipment Co., Chicago, Ill.
Erie Heating Systems, Inc., Erie, Pa.
Ilg Electric Ventilating Co., Chicago, Ill.
McQuay Radiator Corp., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
Nelson Corp., Herman, The, Moline, Ill.
New York Blower Co., Chicago, Ill.
Peerless Unit Ventilation Co., Inc., Bridgeport, Conn.
Skinner Bros. Mfg. Co., St. Louis, Mo.
St. Louis Blow Pipe & Heater Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Thermal Units Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
Wing Mfg. Co., L. J., New York.
York Heating & Ventilating Corp., Philadelphia, Pa.
Young Radiator Co., Racine, Wis.

HEATING SYSTEMS, VACUUM
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago Ill.
McAlear Mfg. Co., Chicago, Ill.
Sarco Co., Inc., New York.
Spencer Heater Co., Williamsport, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

HEATING SYSTEMS, VAPOR
American District Steam Co., North Tonawanda, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Gorton Heating Corporation, New York.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Spencer Heater Co., Williamsport, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Webster & Co., Warren, Camden, N. J.

HEATING SYSTEMS, WATER
American Radiator Co., Buffalo, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Grinnell Co., Providence, R. I.
Hornung, J. C., Chicago, Ill.
Mueller Co., Decatur, Ill.
Page Boiler Co., Wm., H., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Spencer Heater Co., Williamsport, Pa.

HUMIDIFIERS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Grinnell Co., Providence, R. I.
Johnson Service Co., Milwaukee, Wis.
Lewis Corporation, Minneapolis, Minn.
National Air Filter Co., Chicago, Ill.
Schleicher, Inc., Gary, Ill.
National Regulator Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
York Heating & Ventilating Corp., Philadelphia, Pa.

HUMIDITY CONTROL
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Foxboro Co., Inc., The, Foxboro, Mass.
Grinnell Co., Providence, R. I.
Johnson Service Co., Milwaukee, Wis.
National Air Filter Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.

INSTRUMENTS, ELECTRIC MEASURING
Bristol Co., The, Waterbury, Conn.

INSTRUMENTS, INDICATING AND RECORDING
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.

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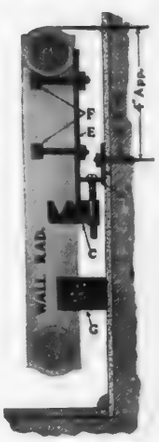

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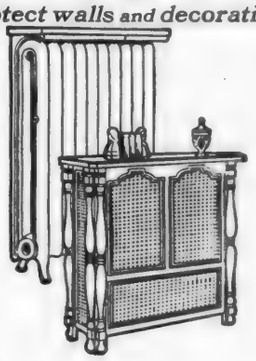

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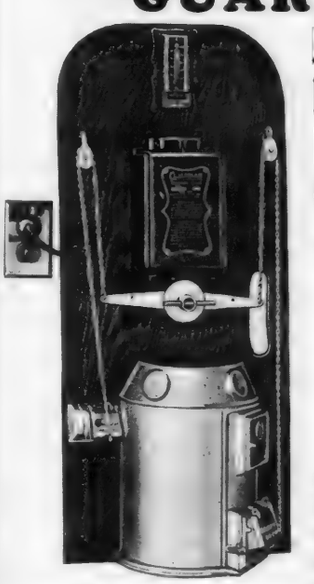

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(See Covering, Boiler, Pipe, etc.)

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Flax-li-num Insulating Co., St. Paul, Minn.
Insulite Co., Minneapolis, Minn.

KETTLES, COPPER
Badger & Sons Co., E. B., Boston, Mass.

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American Blower Co., Detroit, Mich.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Foxboro Co., Inc., The, Foxboro, Mass.

MECHANICAL DRAFT APPLIANCES
(See Draft Appliances, Mechanical)

METALS, THERMOSTATIC
Chace Valve Co., W. M., Detroit, Mich.

METERS, CONDENSATION
American District Steam Co., North Tonawanda, N. Y.
Central Station Steam Co., Detroit, Mich.

METERS, FEED WATER
Central Station Steam Co., Detroit, Mich.
Webster & Co., Warren, Camden, N. J.

METERS, FLOW
Foxboro Co., Inc., The, Foxboro, Mass.

METERS, PITOT TUBE
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.

METERS, STEAM
American District Steam Co., North Tonawanda, N. Y.

MOTORS (ELECTRIC)
Baldor Electric Co., St. Louis, Mo.
Century Electric Co., St. Louis, Mo.
Emerson Electric Mfg. Co., St. Louis, Mo.
Janette Mfg. Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

NOZZLES, ACID RESISTING
Duriron Co., Inc., The, Dayton, O.

NOZZLES, SPRAY
American Blower Co., Detroit, Mich.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Connor Co., Inc., The W. B., New York.
Dunham Co., C. A., Chicago, Ill.
General Air Filters Corp., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

OIL BURNERS
American Nokol Corp., Chicago, Ill.
Electrol Inc., St. Louis, Mo.
Hardinge Bros., Inc., Chicago, Ill.
Johnson Co., S. T., Oakland, Cal.
May Oil Burner Co., Baltimore, Md.
McIlvaine Burner Corp., Chicago, Ill.
Pascoe Co., The Wm. H., Chicago, Ill.
Preferred Oil Burners, Inc., Peoria, Ill.

OIL BURNER EQUIPMENT
American Steam Pump Co., Battle Creek, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Hornung, J. C., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
Johnston Brothers, Inc., Ferrysburg, Mich.
Schutte & Koerting Co., Philadelphia, Pa.

OIL BURNER IGNITION AND CONTROL EQUIPMENT
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Penn Electric Switch Co., Des Moines, Iowa.
Temperature Control Co., Chicago, Ill.
Time-O-Stat Controls Co., Elkhart, Ind.
White Mfg. Co., St. Paul, Minn.

OZONE APPARATUS
United States Ozone Co. of America, Scottdale, Pa.

PIPE, ACID-RESISTING
Duriron Co., Inc., The, Dayton, O.

PIPE BENDING
Badger & Sons Co., E. B., Boston, Mass.
Clow Co., Jas. B., Chicago, Ill.
Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
National Pipe Bending Co., New Haven, Conn.
Walworth Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

PIPE CASING (WOOD)
American District Steam Co., North Tonawanda, N. Y.

PIPE, CAST-IRON
American Radiator Co., New York.
Clow Co., Jas. B., Chicago, Ill.

PIPE HANGERS
Clow Co., Jas. B., Chicago, Ill.
Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Walworth Co., New York.

PIPE THREADING & CUTTING MACHINES
Crane Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.

PIPE, STEEL
Clow Co., Jas. B., Chicago, Ill.
Crane Co., Chicago, Ill.
National Tube Co., Pittsburgh, Pa.

PRESSURE REDUCING VALVES
(See Regulators, Pressure).

PULLEYS, VARIABLE SPEED
Horton Mfg. Co., Minneapolis, Minn.

PUMPS, ACID RESISTING
Duriron Co., Inc., The, Dayton, O.

PUMPS, CENTRIFUGAL
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Foster Wheeler Corp., New York.
Nash Engineering Co., So. Norwalk, Conn.
Trane Co., The, LaCrosse, Wis.

PUMPS, CENTRIFUGAL, VACUUM HEATING
Ames Pump Co., New York.
Chicago Pump Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Skidmore Corp., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.

PUMPS, CONDENSATION
American Steam Pump Co., Battle Creek, Mich.
Ames Pump Co., New York.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Connor Co., Inc., The W. B., New York.
Dunham Co., C. A., Chicago, Ill.
Eclipse Fuel Engineering Co., Rockford, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

PUMPS, OIL
Connor Co., Inc., The W. B., New York.
Janette Mfg. Co., Chicago, Ill.
Nugent & Co., Inc., Wm. W., Chicago, Ill.

PUMPS, RECIPROCATING STEAM
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.

PUMPS, SUMP
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.

PUMPS, TURBINE
Foster Wheeler Corp., New York.
Nash Engineering Co., So. Norwalk, Conn.

PUMPS, VACUUM
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Foster Wheeler Corp., New York.
Janette Mfg. Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Skidmore Corp., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
Weil Pump Co., Chicago, Ill.

RADIATOR ENCLOSURES AND SHIELDS
American Metal Products Corporation, St. Louis, Mo.
Schleicher, Inc., Gary, Ill.

RADIATOR HANGERS
American Radiator Co., Buffalo, N. Y.
Clow Co., Jas. B., Chicago, Ill.
Grinnell Co., Providence, R. I.
Hartmann Co., Charles, Brooklyn, N. Y.
Healy-Ruff Co., St. Paul, Minn.
Kewanee Boiler Corp., Kewanee, Ill.
McAlear Mfg. Co., Chicago, Ill.

RADIATORS, CABINET AND CONCEALED
Circulair Heat, Inc., Louisville, Ky.
Clow Co., Jas. B., Chicago, Ill.
McQuay Radiator Corp., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
Nelson Corp., Herman, The, Moline, Ill.
Reed Air Filter Co., Inc., Louisville, Ky.
Rome Brass Radiator Corp., New York.
Schleicher, Inc., Gary, Ill.
Shaw-Perkins Mfg. Co., Pittsburgh, Pa.
Thermal Units Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.

RADIATORS, CAST-IRON
American Radiator Co., Buffalo, N. Y.
Burnham Boiler Corp., Irvington, N. Y.
Crane Co., Chicago, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Modine Mfg. Co., Racine, Wis.
National Radiator Corp., Johnstown, Pa.
Nelson Corp., Herman, The, Moline, Ill.
Page Boiler Co., Wm. H., New York.
Pierce, Butler & Pierce Mfg. Corp., New York.
U. S. Radiator Corp., Detroit, Mich.

RADIATORS, GAS HEATED
Clow Co., Jas. B., Chicago, Ill.
General Gas Light Co., Kalamazoo, Mich.

RECEIVERS, AIR
Brownell Co., The, Dayton, Ohio.
Frost Mfg. Co., Galesburg, Ill.
National Pipe Bending Co., New Haven, Conn.
Vapor Engineering Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

RECEIVERS, CONDENSATION
American District Steam Co., North Tonawanda, N. Y.
American Steam Pump Co., Battle Creek, Mich.
Connor Co., Inc., The W. B., New York.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

REFRIGERATING APPARATUS
Vilter Mfg. Co., Milwaukee, Wis.

REGULATORS, BOILER-FEED
Atlas Valve Co., Newark, N. J.
Cissell Mfg. Co., W. M., Louisville, Ky.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.

REGULATORS, DAMPER
American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Atlas Valve Co., Newark, N. J.
Dunham Co., C. A., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Gorton Heating Corp., New York.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicgao, Ill.
National Regulator Co., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Sheer Co., H. M., Quincy, Ill.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Temperature Control Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
White Mfg. Co., St. Paul, Minn.
Wing Mfg. Co., L. J., New York.

REGULATORS, PRESSURE
American District Steam Co., North Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johnson Service Co., Milwaukee, Wis.
Kainer & Company, Chicago, Ill.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
McAlear Mfg. Co., Chicago, Ill.
Mueller Co., Decatur, Ill.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.

REGULATORS, TEMPERATURE
(See Temperature Control)

SEPARATORS, OIL
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Farnsworth Co., Conshohocken, Pa.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Webster & Co., Warren, Camden, N. J.

SEPARATORS, STEAM
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Farnsworth Co., Conshohocken, Pa.
Illinois Engineering Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Sims Co., The, Erie, Pa.
Swartwout Co., Cleveland, Ohio.
Webster & Co., Warren, Camden, N. J.

SPRAY COOLING SYSTEMS
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

SPRAY NOZZLES
(See Nozzles, Spray)

STERILIZER, WATER
U. S. Ozone Corp., Scottdale, Penn.

STOKERS, MECHANICAL
General Stoker Corp., New York.

STRAINERS, OIL
American Schaeffer & Budenberg Div. Consolidated Ashcroft Hancock Co. Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Nugent & Co., Inc., Wm. W., Chicago, Ill.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.

STRAINERS, STEAM
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.

STRAINERS, WATER
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.

TEMPERATURE CONTROL
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div. Consolidated Ashcroft Hancock Co. Inc., Brooklyn, N. Y.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Carrier Engineering Corp., Newark, N. J.
Foxboro Co., Inc., The, Foxboro, Mass.
Fulton Sylphon Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Mercoid Corporation, Chicago, Ill.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Penn Electric Switch Co., Des Moines, Iowa.
Raymond, F. I., Chicago, Ill.
Sarco Co., Inc., New York.
Sheer Co., H. M., Quincy, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Teeple Co., L. R., Portland, Ore.
Temperature Control Co., Chicago, Ill.
Time-O-Stat Controls Co., Elkhart, Ind.
Trane Co., The, LaCrosse, Wis.
White Mfg. Co., St. Paul, Minn.

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Eliminating the use of mercury tubes and relays

NO FRAGILE TUBES

to break or leak; safely installed by any mechanic.

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no transformers. Is not affected by vibration or movement. Designed for *across the line* service, handling motors up to 1 H.P. or even larger.

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and accurate to a degree.

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and harmonious in appearance — an ornament to any home.

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and ready for approved installation.

Complete information on request

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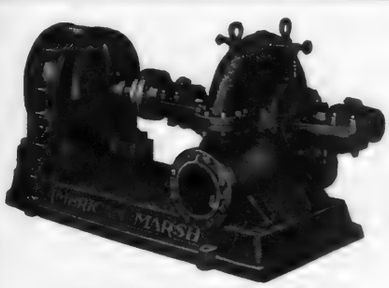
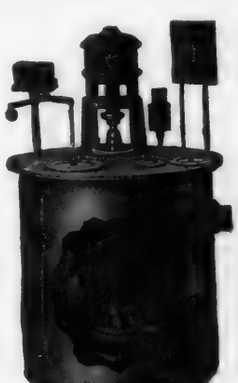


New Single Stage Centrifugal Pump for general service. Bulletin 38.

Automatic Centrifugal Condensation Pump Unit. Bulletin 27.



Automatic Centrifugal Sump Pump for drainage and sewage handling—Bulletin 41.

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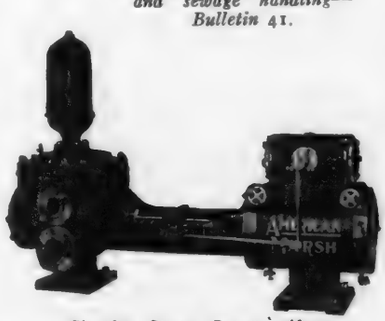
AMERICAN STEAM PUMP CO., BATTLE CREEK, MICHIGAN



Simplex Steam Pump. Also built duplex type. Bulletins 28 and 49.

AMERICAN-MARSH

Centrifugal and Steam Pumping Equipment

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American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Powers Regulator Co., Chicago, Ill.

THERMOSTATS

American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Mercoid Corporation, Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Sheer Co., H. M., Quincy, Ill.
Temperature Control Co., Chicago, Ill.
Time-O-Stat Controls Co., Elkhart, Ind.
White Mfg. Co., St. Paul, Minn.

TRAPS, BUCKET

Crane Co., Chicago, Ill.
Swartwout Co., Cleveland, Ohio.
Trerice Co., H. O., Detroit, Mich.

TRAPS, FLOAT

Crane Co., Chicago, Ill.
General Air Filters Corp., New York.
Sarco Co., Inc., New York.
Swartwout Co., Cleveland, Ohio.

TRAPS, FLOAT & THERMOSTATIC

Dunham Co., C. A., Chicago, Ill.

TRAPS, INVERTED BUCKET (STEAM AND AIR)

Armstrong Machine Wks., Three Rivers, Mich.

TRAPS, LIFTING

Crane Co., Chicago, Ill.
Lytton Mfg. Corp., Franklin, Va.
Swartwout Co., Cleveland, Ohio.

TRAPS, RADIATOR

American District Steam Co., North Tonawanda, N. Y.
Armstrong Machine Wks., Three Rivers, Mich.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Sarco Co., Inc., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

TRAPS, RETURN

American Blower Co., Detroit, Mich.
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Swartwout Co., Cleveland, Ohio.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

TRAPS, STEAM

American Blower Co., Detroit, Mich.
American District Steam Co., North Tonawanda, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Clow Co., Jas. B., Chicago, Ill.
Connor Co., Inc., The W. B., New York.
Crane Co., Chicago, Ill.
Davis Engineering Corp., New York.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
General Air Filters Corp., New York.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Trerice Co., H. O., Detroit, Mich.

TRAPS, VACUUM

American Blower Co., Detroit, Mich.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Swartwout Co., Cleveland, Ohio.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

TUBING, COPPER AND BRASS

Crane Co., Chicago, Ill.
Wolverine Tube Co., Detroit, Mich.

TURBINES, STEAM

Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

TURBO-BLOWERS

Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

UNIT HEATERS

(See Heaters, Unit)

VACUUM CLEANING APPARATUS

American Radiator Co., Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

VALVES, ACID RESISTING

Crane Co., Chicago, Ill.
Duriron Co., Inc., The, Dayton, O.

VALVES, AIR, AUTOMATIC

American Radiator Co., Buffalo, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Hoffman Specialty Co., New York.
Jenkins Bros., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Page Boiler Co., Wm., H., New York.
Powers Regulator Co., Chicago, Ill.

VALVES, AIR RELIEF

American Radiator Co., Buffalo, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Gorton Heating Corp., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Sarco Co., Inc., New York.
Trane Co., The, LaCrosse, Wis.

VALVES, BACK PRESSURE

Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York.

VALVES, BALANCED

Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.

VALVES, BLOW-OFF

Crane Co., Chicago, Ill.
Jenkins Bros., New York.
Lytton Mfg. Corp., Franklin, Va.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York.

VALVES, CHECK

Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York.

VALVES, FLOAT

Atlas Valve Co., Newark, N. J.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Schutte & Koerting Co., Philadelphia, Pa.
Time-O-Stat Controls Co., Elkhart, Ind.

VALVES, GATE

American District Steam Co., North Tonawanda, N. Y.
Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh Valve Co., Dunkirk, N. Y.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York.

VALVES, GLOBE, ANGLE & CROSS

Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh Valve Co., Dunkirk, N. Y.
National Radiator Corp., Johnstown, Pa.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York.

VALVES, HYDRAULIC-OPERATING

Crane Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Walworth Co., New York.

VALVES, MAGNETIC

Time-O-Stat Controls Co., Elkhart, Ind.

VALVES, NON-RETURN

Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York.

VALVES, RADIATOR

American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Gorton Heating Corp., New York.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh & Co., Jas. P., Chicago, Ill.
Marsh Valve Co., Dunkirk, N. Y.
National Radiator Corp., Johnstown, Pa.
Page Boiler Co., Wm. H., New York.
Pierce, Butler & Pierce Mfg. Corp., New York.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Walworth Co., New York.
Webster & Co., Warren, Camden, N. J.

VALVES, PRESSURE REDUCING

(See Regulators, Pressure)

VALVES, REGULATING

Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kainer & Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Mueller Co., Decatur, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Walworth Co., New York.

VALVES, RELIEF (WATER)

American Schaeffer & Budenberg Div. Consolidated Ashcroft Hancock Co. Inc., Brooklyn, N. Y.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Kainer & Co., Chicago, Ill.
Kennedy Valve Mfg. Co., Elmira, N. Y.
McAlear Mfg. Co., Chicago, Ill.
Mueller Co., Decatur, Ill.
National Radiator Corp., Johnstown, Pa.

VALVES, SAFETY

American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div. Consolidated Ashcroft Hancock Co. Inc., Brooklyn, N. Y.
Crane Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
National Radiator Corp., Johnstown, Pa.
Time-O-Stat Controls Co., Elkhart, Ind.
Walworth Co., New York.

VALVES, STOP AND CHECK

(See Valves, Non-Return).

VENTILATING SYSTEMS

American Blower Co., Detroit, Mich.
American Radiator Co., Buffalo, N. Y.
Autovent Fan & Blower Co., Chicago Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
General Air Filters Corp., New York.
Nelson Corp., Herman, The, Moline, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
St. Louis Blow Pipe & Heater Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

VENTILATING SYSTEMS, ACID

Duriron Co., Inc., The, Dayton, O.

VENTILATORS

Bayley Blower Co., Milwaukee, Wis.
DeBothezat Impeller Co., Inc., New York
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

VENTILATORS, FLOOR

Aeolus Dickinson, Chicago, Ill.
American Blower Co., Detroit, Mich.
American Metal Products Corporation, St. Louis, Mo.
Buffalo Forge Co., Buffalo, N. Y.
Knowles Mushroom Ventilator Co., New York.
Ventilating Products Co., Chicago, Ill.

VENTILATORS, ROOF

Aeolus Dickinson, Chicago, Ill.

VENTILATORS, UNIT

American Blower Co., Detroit, Mich.
Nelson Corp., Herman, The, Moline, Ill.
Peerless Unit Ventilation Co., Inc., Bridgeport, Conn.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

WATER STERILIZERS

Clow Co., Jas. B., Chicago, Ill.

WEATHER STRIPS, METAL

Athey Co., Chicago, Ill.

WRENCHES, STILLSON

Walworth Co., New York.

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1 MILE of Ric-wil at ROCHESTER, N.Y.

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2300 FT. of Ric-wil at BINGHAMTON, N.Y.

1½ MILE of Ric-wil at AKRON, OHIO

Ric-wiL Conduit Type F, with Dry-paC insulation, fully closed construction, as installed by these four district heating companies.

HUNDREDS OF MILES OF Ric-wil NOW IN USE

Insulating with Dry-paC the 8" steam and 3" return lines through which the Binghamton Light, Heat & Power Co. is supplying heat and process steam to The Endicott-Johnson Shoe Co. Tests of this line showed an efficiency of over 93%.

WHERE underground steam distributing mains are the very arteries through which a corporation expects to derive its profits, as in the case of district heating companies, you may depend upon this—that the planning of insulation for those mains is not regarded as a light responsibility.

$100,000 buried in the ground for such a purpose *must* make possible the delivery of steam at a profit. The lines must be efficient—and they must *stay* efficient. The men who furnish the money demand it.

More and more in recent years—and notably last year and thus far in 1929—the engineers in charge of such important work are specifying Ric-wiL, after thorough study of it. It appeals to them because it is so skillfully engineered for its job and because its record in the ground is astonishing. They watch its smooth machine-like installation. They turn on the steam, they test it. The result, almost without variation, shows efficiency between 92% and 94%.

You may have on your board just now plans involving only a run of 50 feet, but you can make sure of its success by the experience of the big buyers who are installing Ric-wiL.

Information about the four 1928 jobs mentioned in the panels above is yours for the asking.

The Ric-wiL Company

1567 Union Trust Bldg., Cleveland, Ohio

Originators *of* Waterproof Conduit Filler

Ric-wiL

UNDERGROUND CONDUIT

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Sturtevant Co., B. F. 115,
Swartwout Co. .....

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Time-O-Stat Controls Co.....
Temperature Control Co.....
Titusville Iron Works.....
Trane Co. .....
Trerice Co., H. O.....

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U. S. Radiator Corp. .....

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Whitlock Coil Pipe Co. .....
Wing Mfg. Co., L. J. .....
Wolverine Tube Co.....

Y

York Heating and Ventilating Corp. .....
Young Radiator Co. .....

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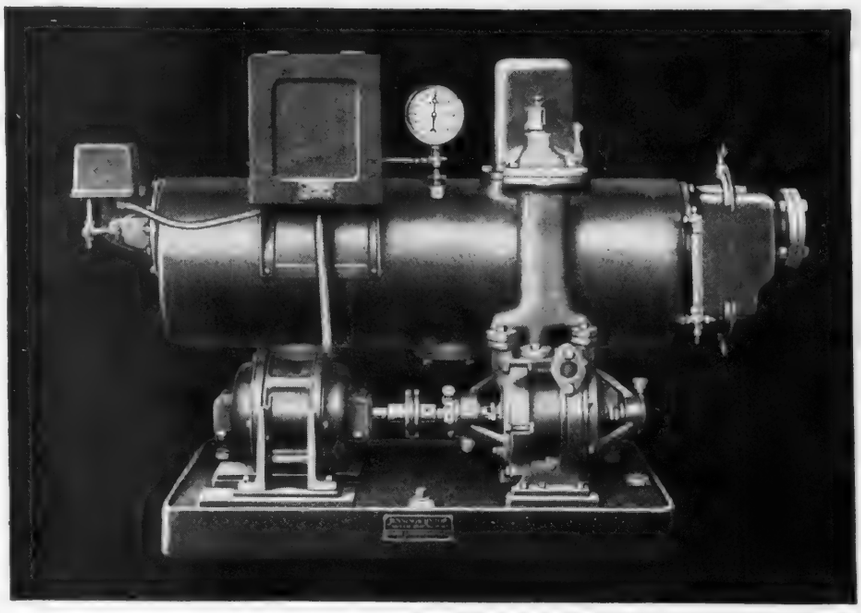

Jennings Vacuum Heating Pumps are furnished in capacities ranging from 4 to 400 g.p.m. of water and 3 to 171 cu. ft. per min. of air. Either automatically controlled or for continuous operation. For serving up to 300,000 sq. ft. equivalent direct radiation.

. . . that you have the right pump for the job

There is no uncertainty when you select a Jennings Vacuum Heating Pump. You know beforehand that the return line steam heating system on which it is installed will be kept absolutely clear of air and condensation. For, if desired, a certified test report is furnished with every Jennings Pump. This report gives the exact number of g.p.m. of water and cu. ft. per min. of air that the pump delivers under working conditions. No need to depend on published ratings which give merely the number of sq. ft. of radiation for which the pump is recommended. With the actual working capacity known, you can be sure you have the right pump for the job.

If you wish to conduct your own tests, the calibrated orifice with which the original factory test was made will also be supplied.

Bulletin 85 gives complete details on the construction and operation of the Jennings Vacuum Heating Pump. Write for a copy.

RETURN LINE AND AIR LINE VACUUM HEATING PUMPS—CONDENSATION PUMPS—COMPRESSORS AND VACUUM PUMPS FOR AIR AND GASES — STANDARD AND SUCTION CENTRIFUGAL PUMPS — MARINE PUMPS — SEWAGE EJECTORS — SUMP PUMPS — FLAT BOX PUMPS — HOUSE SERVICE PUMPS.

Jennings Pumps

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H. A. Durr & Co., *Engineers*
A. Kilander & Co.
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A complete Marsh System—including heating specialties, gauge board and gauge board instruments—installed.

Marsh System Heats
World's Greatest Indoor Stadium

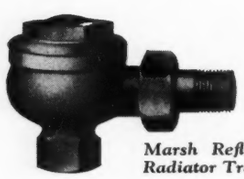
Marsh Heating Systems

Costing $7,000,000, and capable of seating 25,000 people, this gigantic structure will long stand as a monument to Chicago's interest in sport events.

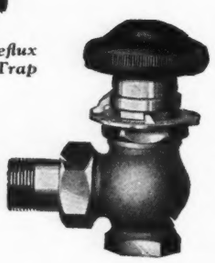
And this outstanding building—as well as outstanding buildings all over the country—will be comfortably warmed with a Marsh Heating System.

The result of 64 years of experience—engineering genius and manufacturing skill, devoted to the making of heating equipment—Marsh Systems *provide an accuracy and certainty of control never before attained.*

It is this unusual control that makes possible the remarkable records for fuel economy established by Marsh Systems wherever installed.



Marsh Reflux Radiator Trap



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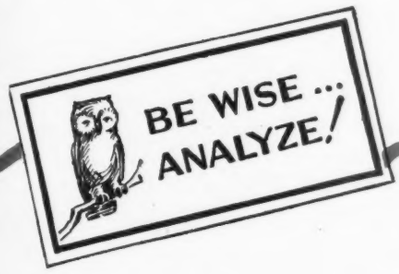
Bond Building, WASHINGTON, D.C.
Other Offices in Principal Cities

JAS. P. MARSH & CO.

Which would you choose?

These two oranges *look* good. But, inside, one may be unusually juicy; the other "pulpy". Choosing the best one is largely guesswork . . . until you analyze them both.



Judging the construction of various boilers, too, is often largely guesswork, unless you *look inside* and carefully observe how they are designed and built. So the alert steam fitter today *analyzes*. And he is richly rewarded!

Take the Weil-McLain Jacketed Boiler as an example. When he analyzes this boiler for fuel combustion . . . he finds three distinct features that end fuel waste and contribute to scientific combustion.

The first is: All grates in the fire box are *shaking* grates. The second is: Rounded "live fire" corners in the fire box. The third is: Added combustion space.

As a result, he finds that the fuel in this jacketed boiler is more completely burned. The fire burns bright and clean at *every* point. It lasts a long time and requires only infrequent attention. Costly waste down into the ashpit is definitely ended.

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Weil-McLain Boilers excel in fuel combustion, heat utilization, convenient operation, in meeting modern fuel trends and in ease of installation. They are supremely efficient. They *fight fuel waste.*

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BOILERS

"SEE THE WEIL-McLAIN JOBBER IN YOUR TERRITORY"

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SALES TALES

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THE
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This CONTRACTOR *has a* *dozen* DOCTORS *working for him!*

HE started with the hospital job. This heating contractor put in a Hoffman Controlled Heat system. With absolute control over boiler and radiators at every point to assure safe, automatic operation.

This system delivered locally to each room's radiator as much or as little heat as was desired, with no effect on other rooms.

The house physician built a new home. He called in the heating contractor who did the hospital job—told him to put Hoffman Controlled Heat in his house.

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In a few years twelve physicians had Hoffman Controlled Heat in their homes. This system is such a great advance over other methods that the doctors of that city talked about their heating plants. They set a style, and the heating contractor got the jobs their conversation brought his way.

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